7TH TIER

Contractors and Engineers Monthly

OCTOBER
1934

ST. LOUIS PUBLIC LIBRARY
Arts & Letters Dept.

Asphalt
and
Concrete
Paving

•

Grading

•

Levees

•

Lubrication

•

Underpasses

Walking Dragline on Levee Construction
See page 27

Beating Wet Weather on Levee Enlargement

•

Fleet of 28 Trucks Hauled Lime-Rock Base

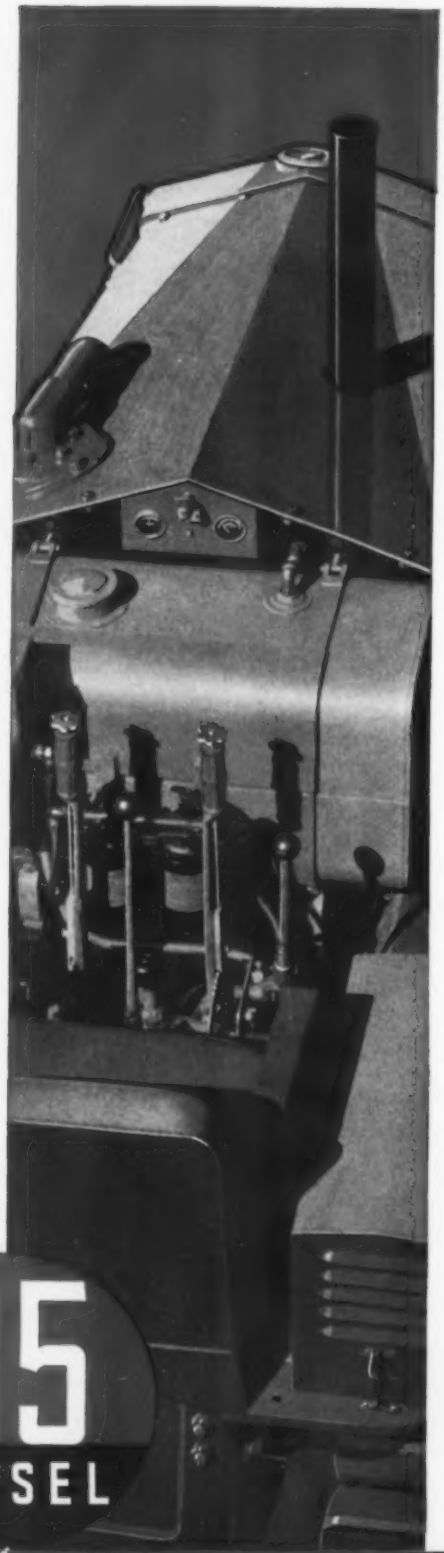
•

Are You Losing Profits Through Lost Time?

A NEW DIESEL TRACTOR WITH

Six cylinder ENGINE...AND *electric* STARTER

Write us for complete specifications and details of the 26 features of Cletrac design.



NOW, a full diesel, six-cylinder Cletrac in the medium power class, equipped with electric starting. Cletrac principles of design and construction that have proved so satisfactory in the Cletrac 80 Diesel and the Cletrac 35 gasoline tractors have been embodied in the Cletrac 35 Diesel. It is a "proven" tractor, whose dependability may be relied upon. The six-cylinder engine of the Cletrac Diesel 35 gives a steady flow of power that will enable you to go places with big loads. The smoothness of operation of a six-cylinder engine eliminates harmful vibration and gives you a long period of economical and dependable tractor performance. Electric starting gives you a "head" start on your job, because it requires less starting time and consequently permits more working time. All you do is turn a switch and you are ready for action.

THE CLEVELAND TRACTOR CO.
Cleveland, Ohio

CLETRAC *Crawler Tractors*

THE *only* CRAWLER TRACTOR WITH CONTROLLED DIFFERENTIAL STEERING

Texas Builds Triple Railroad Underpasses

The Eureka Underpasses Looking North Under the G H & S A Ry. to the Katy and H & T C Ry. Underpass

Four Track Crossings Eliminated at Western Limits of Houston

IN 1917 and 1918 Texas Route 6 leading from Houston to Camp Logan and the north and west was very heavily traveled and heavy equipment was hauled over it constantly. A Federal Aid project was instituted to rush the construction of a 24-foot concrete pavement which unfortunately required crossing the double tracks of the G H & S A, and the single tracks of the M K T and the H & T C at grade, and had two right angle turns at the city limits. In recent years the increase of traffic to Austin, Waco, Dallas and Fort Worth over Route 6 and Route 20, which takes off from the former 52 miles northwest of Houston, has caused many accidents at the grade crossings, in spite of standard bell signals at each crossing and warning signs indicating "Four Tracks" to be crossed.

These accidents recurring with increasing frequency led to the creation of two new projects under the Public Works appropriations for federal highways, one of them simply a reopening of the old original Federal Aid project. These new projects were designated NRM 32 Pt 2 and NRM 535E. The work has provided interesting problems of cooperation between City, County, State, Contractor and three railroads as well as novel construction ideas developed by the contractor. The two projects were awarded as one contract to Russ Mitchell, Inc., Houston, Texas.

Certain parts of the work were done by force account by the railroads and charged to the state. The purchase of some materials by the railroads was permitted because they are large buyers of these materials under their own specifications, and also the standard designs of abutments of the different railroads were adhered to by the engineer of design of the State Highway Department, who made only such changes as were necessary to harmonize the face of the abutments which were all within a distance of 250 feet.

Constructing the Temporary Pile Trestles

The first work done on the project was the construction of the temporary pile trestles which started about February 1, 1934, using a Vulcan No. 2 steam hammer and railroad equipment. The untreated wood piling was driven to about 12 feet below the roadway grade through a sandy clay, the total lengths of the piles varying from 30 to 40 feet. Following the standard practice of the three railroads there were varying numbers of pile bents driven back of the abutment: for the G H & S A there was a total of eight bents with two behind each abutment; for the "Katy" there was a total of ten bents with three behind each abutment; and for the H & T C there were in all twelve bents with four behind each abutment. These bents were all driven by the railroads on force account, paid for by the State and were not included in the contract. Each railroad fur-

Layout of the Underpasses and New Highway at the Eureka Crossing

nished the timber for and built its own trestle and billed the State for the material and labor.

Immediately following the completion of the trestles the track was transferred to the temporary superstructure and the weight of the trains taken by this construction. The excavation for the abutments was started immediately in a novel manner. As the soil was a sandy clay it stood well and could be handled readily without sheeting. An Austin bucket excavator was used to cut out the abutment section with practically vertical sides and the material stood so well that the footings were poured without any sheeting. The bottom of the footing excavation was at water table elevation. There was no trouble unwatering the excavation with two small pumps, one a diaphragm and the other a centrifugal.

Foundations and Concreting

The foundation piling had an average penetration of 16 feet and it was specified that each pile should develop a load-bearing capacity of 25 tons. This was shown by test to be greatly exceeded.

The concrete for the abutments was poured by a Koehring 27-E paver with chutes. In lining the abutment forms, plywood panels were used for exposed faces, greatly reducing hand rubbing as an item of extra expense for the contractor. He reported that the use of the plywood saved him its cost about twice over in the savings in rubbing. Richmond Tyscrus and spacers were used on all the forms for the abutments.

The concrete was a designed mix, using a water-cement ratio and by the absolute volume method. The specifications required six sacks of cement per cubic yard of concrete, and workability was secured with 5.8 gallons of water per sack. The individual batches of concrete contained the following weights of aggregates: 2,304 pounds of gravel, 1,388 pounds of sand and six sacks or 564 pounds of cement.

The Drainage System

The approaches to the underpass are at 3.80 per cent grade, connected by a 300-foot vertical curve. The pavement slab is a conventional curb and gutter section, 40 feet between curbs. Water from the gutters is collected by four inlets, which discharge through concrete sewers, 18 to 30 inches, into a sump. The sump, or wet-well, constructed of monolithic reinforced concrete with a dry-well which houses the pump, extends 25½ feet into the ground. The lower 12 feet has vertical sides, the remainder being pyramidal in shape, tapering from 8 feet x 8 feet to 3½ x 3½ feet at ground level. In the top is constructed a standard City of Houston manhole. The dry-well is 10 feet x 8 feet in plan and of the same depth as the wet-well. Superimposed upon the dry-well is the motor house, also of concrete. It is the same size in plan and extends 9 feet above the ground. The pump is a 6-inch Economy centrifugal with 8-inch suction and discharge. It is set in the bottom of the dry-well with the suction pipe extending through the wall into the sump. The 20-hp electric motor is set at ground level and connected by a vertical shaft to pump. Discharge is made into a surface ditch. The electric motor is provided with a Mercoid automatic switch.

Supplementing the above is a subsurface drainage system consisting of open joint 4-inch vitrified tile placed in trenches 12 inches deep and 12 inches wide and covered with crushed rock. These discharge into the same inlets which collect surface water.

Data on the Three Abutment Structures

The G H & S A abutments are semi-gravity sections in accordance with the specifications of the engineering department of that railroad. The girder span was composed of three I beams 36 inches deep under each rail and with suitable diaphragm plates or spacers. The girder has a clear span of 42 feet and the bridge seat is 2 feet 2 inches wide. The I beams weigh 176 pounds per foot. The two abutments required 456.70 cubic yards of concrete and 19,638 pounds of reinforcing steel. The back of each abutment on the contract was waterproofed with a double mopping of asphalt. The structural steel required for this span was 108,095 pounds, there were 600 feet of foundation piling and 1,300 cubic yards of abutment excavation. The footing measured 76 x 13.5 feet in plan, and 3 feet thick and the abutment measured 20.6 feet high from the top of the footing.

The "Katy" abutments are of cantilever section and have a construction joint between them and the H & T C abutments, although to the casual observer there is no difference between the two, the faces having been carefully designed to compensate for any difference in basic railroad designs. There are two 36-inch, 280-

pound I beams under each rail with a 42-foot clear span. There is a 2-foot 4-inch seat at each abutment. This abutment was designed for double tracks, although there is only one at present. The concrete required was 469.10 cubic yards, reinforcing steel 24,810 pounds, structural steel 58,000 pounds, foundation piling 640 feet, and abutment excavation 880 cubic yards. The footing measured 43 feet 3⅛ inches x 12 feet and 57 feet 8¾ inches x 12 feet in plan, 3.5 feet thick and the abutments were 21.7 feet high above the footing.

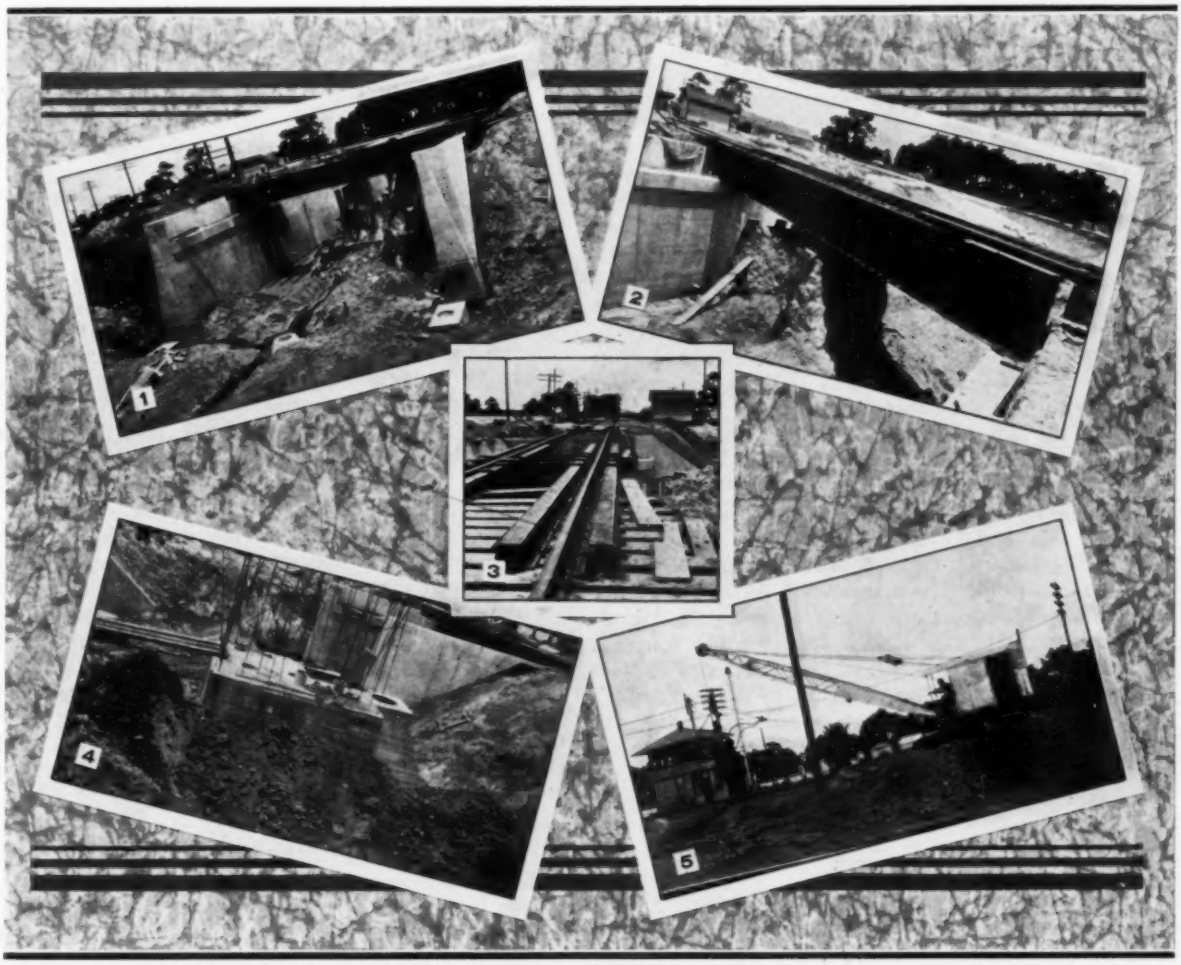
The H & T C abutments are of semi-gravity section, carrying built-up plate girders 3 feet 7¾ inches high with two under each rail. The girders are 56 feet ¾-inch long, skewed 35 degrees 57 minutes with 42 feet between the faces of the two abutments, giving a clear span of 51.88 feet. This abutment was also designed for double track although it will carry only a single track for the present. The concrete required was 597.90 cubic yards, reinforcing steel 26,500 pounds, structural steel 80,585 pounds, foundation piling 900 feet and abutment excavation 1,200 cubic yards. The footing measured 67 feet 6 inches x 15 feet and 89 feet 5 inches x 15 feet in plan, 3.5 feet thick and the abutments were 20.83 feet high above the footing.

The roadway excavation for the entire project was 34,258 cubic yards. The concrete for the abutments and drainage structure was batched in a Butler weighing batcher served by a Koehring crane located about 500 feet from the structures.

All the I beam and girder spans were swung into place by locomotive cranes, one for each track unit. The first train over the H & T C plate girders after they were transferred from the temporary to the permanent position went over at about noon July 26, 1934. All trains on all structures had slow orders during the entire progress of the work.

PERSONNEL

The contract for this job, known as Eureka Underpass, at the city limits of Houston, Texas, was awarded to Russ Mitchell, Inc., of Houston for whom R. F. Jordan was Superintendent. For the State Highway Department Thomas C. Collier was Resident Engineer. For the railroads the work was under the direction of C. M. Staples, Division Engineer, Southern Pacific Lines, which includes the G H & S A and the H & T C, and C. R. Montgomery, Assistant Engineer for the "Katy."



DETAILS OF CONSTRUCTION OF THE EUREKA UNDERPASSES AT HOUSTON, TEXAS

1. *The south end of the Katy Underpass showing the center pile bent still in place.* 2. *The H & T C girder span.*
3. *The method of carrying the rails onto the H & T C girder skew span before the transfer to the permanent bed.*
4. *The drainage sump during backfilling.* 5. *Backfilling against the abutments and around the sump with a dragline.*

Improving U. S. Route 1A

Through an Industrial City

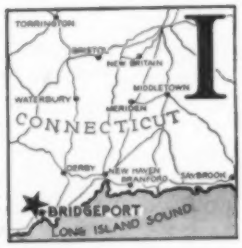
Silliman & Godfrey

Hasten Completion

of

NRM Project

in Bridgeport, Conn.



IT is now quite customary to by-pass large cities by alternate through-highway routes around the business or industrial centers. The Connecticut State Highway Department maintains an alternate route for U. S. 1 through the northern section of Bridgeport, Conn., leaving the main route at Fairfield on the west and again joining it at Stratford, 7 or 8 miles to the eastward. While this alternate Route 1A was primarily intended for motor trucks, most through passenger automobiles prefer it, in order to avoid city congestion. The westerly section of this cut-off was resurfaced a few years ago with asphalt and is still in fair condition. The middle section, about 1.2 miles in length, was resurfaced with sheet asphalt on a concrete base as NRM Project No. 62 B during the summer of 1934.

The major portion of this project lay on the north and south sides of a parkway about 125 feet wide and containing many magnificent elms. On the south side of the park area were located two street railway tracks which for years have caused considerable confusion, as all motor traffic was eastbound on this section, yet occasionally met a westbound street car. The contract involved the removal of these southerly tracks along the parkway. A 7-inch plain concrete base was laid in 9-foot strips with a total width of 22 to 45 feet on the south side of the park and 23 feet on the north side. At the west end beyond the parkway, the concrete paving is 40 feet wide and all of it was surfaced with a 3-inch asphalt top. The narrow strip between the outer 9-foot strips of concrete base and up to the reset bluestone curbs was poured with transit-mixed concrete.

The necessary installation of new water service lines and gas lines was made well ahead of the contractor's paving by the Bridgeport Hydraulic Co. and the Bridgeport Gas Co. respectively. The contractor reported a maximum of cooperation on the part of these two utilities which greatly helped in expediting the work.

Grading

The grading of this project started on April 5, 1934 with the average cut about 1 to 5 feet deep, and involved the removal of 13,379 cubic yards, including the removal of the trolley tracks, ties and some old concrete base and waterbound macadam. This work was handled by a ¾-yard Osgood steam shovel and a 1¼-yard Marion steam shovel. The disposal of the material was facilitated by the fact that the city itself hauled away all of the material for use as subbase on some city CWA work.

The contractor maintained a 30-hour week for all employees by the use of two 5-hour shifts per day for laborers and three 10-hour days a week for the equipment operators.

Form Setting Not Easy

Since the new concrete base had to be carried to within 3 or 4 inches of the edge of the street car rails at several places, the setting of forms was somewhat difficult. The street car company furnished two men who cut the outer ends of the old wood ties close to the edge of the rails to permit setting the forms and pouring the concrete base.

Fine grading, following up the steam shovels, was handled by a Caterpillar one-man grader ahead of the forms. Then came five men hand-cutting the trench for the Heltzel steel forms. The same crew returned to set the forms after a sufficient footage of trench had been prepared to grade.

On the final grade, four men with hand shovels and two scratch templates with adjustable teeth set every 6 inches across the width of the slab filled low spots and cut down high spots as shown up after the rolling by a Buffalo-Springfield 7-ton gas roller.

Commercially Batched Aggregate Used

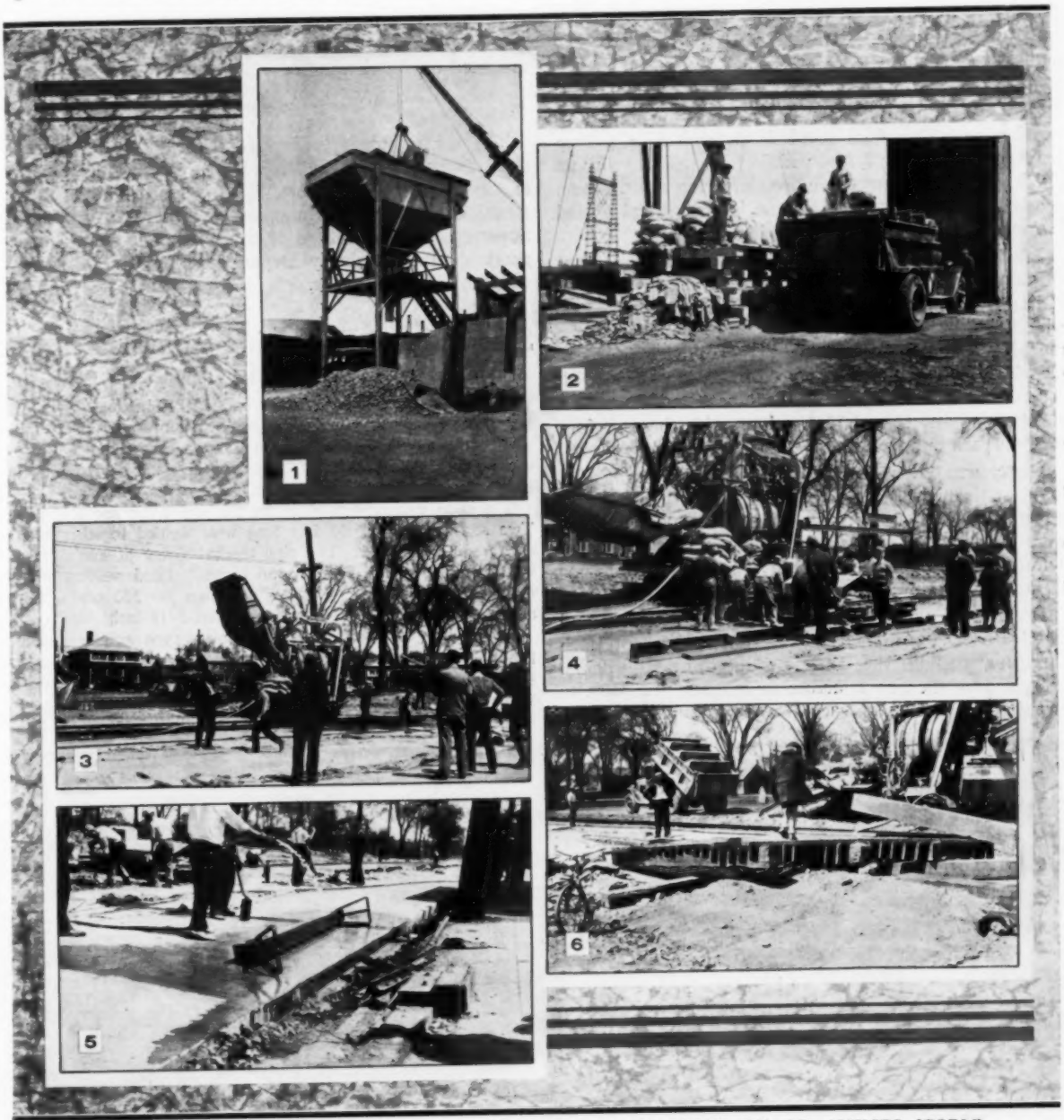
Batches accurately proportioned by weight were furnished by the R. E. Donnelly Co. of Bridgeport, delivered to the contractor's fleet of 4-batch International trucks at Sykes dock 1.8 miles from the center of the job. The complete Butler batching plant located on the dock at the river front was fed by a steel boom derrick and clamshell from barges moored alongside.

The trucks received the four batches, the stone being placed first and then the sand, and then pulled out about 0.1-mile to the cement dock in the same yard where four men dumped six bags of cement on each batch and one man on the truck shoveled the sand so as to cover most of the cement to prevent wastage by blowing off the trucks.

The average batch consisted of 1,825 pounds of 1¼-inch crushed trap rock, 455 pounds of ¾-inch crushed trap rock, 1,185 pounds of sand, six bags of cement, and 5½ gallons of water added in the paver. Two quarts of calcium chloride solution, consisting of four pounds of flake per gallon of water, was added to the mix for each bag of cement used.

FINISHING—THE GREATEST PROBLEM IN CONCRETING

Concreting was started on May 1 along the south side of the park area, the plan being to complete the base and top of this section while the north roadway, normally used for westbound traffic, was used for two-way traffic. Upon completion of the south side, it was opened to two-way traffic and the north section paved. The contractor was considerably delayed during the early part of the work by two weeks of bad weather but



POURING THE CONCRETE SLABS AS THE POPULATION LOOKS ON OR AMUSES ITSELF

1. The batching plant on a dock on the river front. 2. Loading cement onto the batches at the platform about 500 feet from the batcher. 3. The paver moving forward after pouring a section of slab. 4. Moving the finishing machine by hand over a section of wood forms too close to the street car ties to operate the machine. 5. Washing off the hand strike-off after screeding a section of slab where the finishing machine could not be used. 6. The type of bridge used at entrances to garages and filling stations to permit "business as usual" during paving.

completed the contract by July 25, 1934 within 73 days. Seventy-five working days were originally allowed.

The first 9-foot strip poured was south of the parkway area and on the side away from the street car tracks. On this first section the form crew had to hustle as it was the only section where they were required to set a double line of forms. This same crew also pulled the forms 24 hours after pouring and the 1-ton Chevrolet service trucks hauled them ahead.

The batch trucks turned where convenient along the job and backed to the paver skip outside of the forms. The paver, with the exception of the time when the first strip was poured, ran outside of the forms. One man handled the tripping of the batches, delivering them to the skip of the Ransome 27-E paver, and the paver operator kept the boom swung well over the adjacent strip for pouring. There were four puddlers, two hand finishers and two men who spread and wet down the burlap. The final hand finish was with a long handled float with a 3-foot paddle followed by a broom finish for bond. There were no reinforcing or expansion joints in the concrete base and no joint material placed between adjacent strips.

Machine finishing was handled with an Ord mechanical finisher which could not be used on certain sections of the strips adjacent to the street car tracks, to which the forms ran so close that the overhang of the machine, necessarily set 3 inches below the car tracks to permit the surfacing to be placed later, interfered with the track structure. This made it necessary to use an 8 x 8-inch hand screed 10 feet long with three or four men on each end to pull it.

Water was taken from a Bridgeport Hydraulic Co. hydrant through 2½ and 2-inch pipes run close to the paver. Two 1½-inch paver hose, each 200 feet long, were attached to the paver, permitting flexibility or connections and minimizing delays in shifting from one tap to the next.

Because of numerous garages, filling stations, and small stores, whose delivery trucks had to approach close for loading, the contractor used heavy wooden bridges over the new concrete at frequent intervals to permit local traffic to reach loading points.

The Asphalt Top

The 3-inch sheet asphalt top was produced in the contractor's own permanent Cummer asphalt plant on Lindley Street about a mile from the job. This plant is said to be the only one in the State of Connecticut which can make binder and sheet top at the same time.

Bridge Widening

At about the center of the job near the Bridgeport works of the General Electric Co., it was necessary to build cantilever sidewalks 6 feet wide as the old 6-foot 3-inch sidewalk was included in the widened street construction. All concrete for this work was hauled by the contractor's own transit-mix concrete bodies mounted on Mack chassis.

Personnel

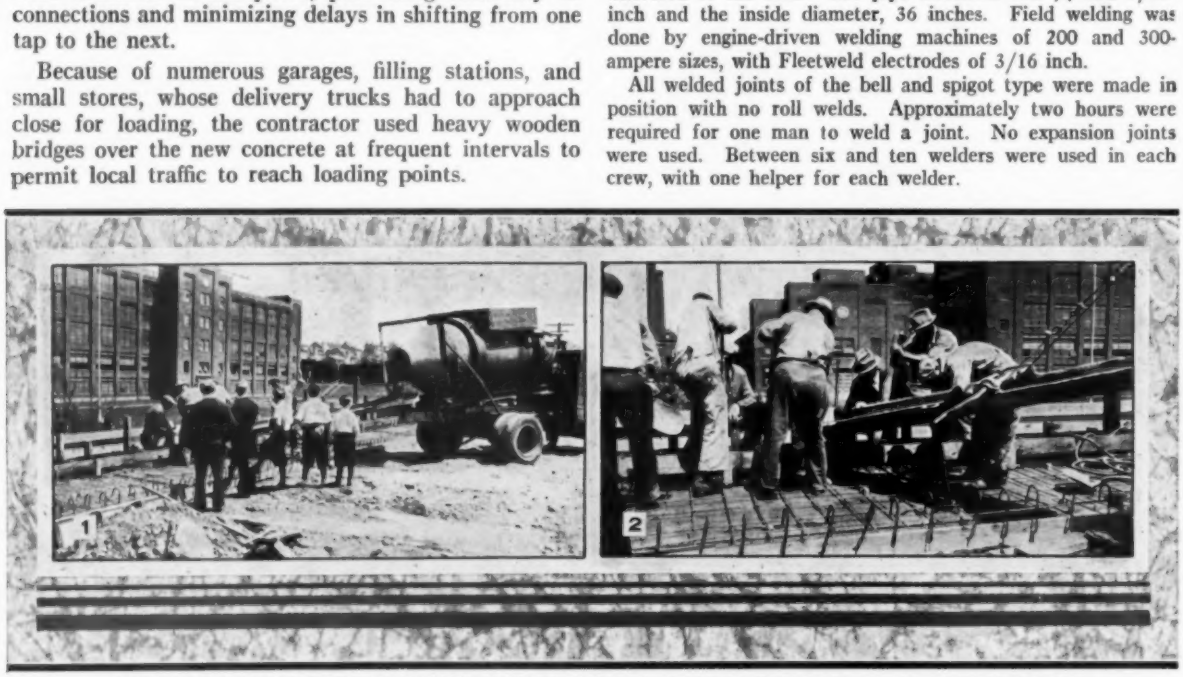
The contractor for this 1.2-mile concrete base and sheet asphalt top NRM Project No. 62 B was Silliman & Godfrey of Bridgeport, Conn., for whom Elmer Beard is General Superintendent and Vincent Sullivan, Superintendent in charge of this work. For the Connecticut State Highway Department, W. C. Maynard was Resident Inspector.

San Gabriel Pipe Line Completed by Arc Welding

ONE of the few large water lines of 1934, the 18½-mile San Gabriel pipe line extending from Morris Dam at the mouth of San Gabriel Canyon, was completed by arc welding. The line was built for the City of Pasadena, Calif., by the Consolidated Steel Corp. of Los Angeles.

The shop welding was done by the automatic arc process. Two sections of pipe 30 feet long were welded together and delivered to the field. The pipe thickness was ¼ and 5/16-inch and the inside diameter, 36 inches. Field welding was done by engine-driven welding machines of 200 and 300-ampere sizes, with Fleetweld electrodes of 3/16 inch.

All welded joints of the bell and spigot type were made in position with no roll welds. Approximately two hours were required for one man to weld a joint. No expansion joints were used. Between six and ten welders were used in each crew, with one helper for each welder.



POURING CANTILEVER SIDEWALKS ON A BRIDGE NEAR THE GENERAL ELECTRIC WORKS
1. *Delivering concrete from the transit mixer.* 2. *The business end of the delivery chute, showing the puddling operations.*

Settling Fills *in the* Pacific Northwest

Improved Blasting Methods Used by Highway Contractors Proved Effective

By
A. J. McAdams

EXPLOSIVES have played a large part in the development of straight-line, hard-surface roads for high-speed automobile traffic in the Pacific Northwest. Within the last five years, however, dynamite has tackled a new job in swampy areas, for blasting is commonly resorted to as a means of accelerating the settlement of road embankments built across these boggy places. The first fill settlement job attempted in the Pacific Northwest was on State Road No. 9 near Shelton, Wash. The contract called for an embankment about 600 feet long across a cranberry bog of muck and peat varying from 3 to 22 feet deep. The surface was covered with a heavy sod mat consisting mostly of cranberry bushes. The ends of the swamp were heavily covered with stumps, trees and buried logs. The new road location was far enough away from buildings to permit surface blasting without doing damage.

The contract was awarded to Alex Besoloff of Seattle who directed the work personally and E. W. Elwell represented the District Highway Office of the State. The first operation was to tear up the surface mat and dislodge the stumps and buried logs. For this work, the cross-section method of blasting was used. A row of holes was placed down the center line of the roadway with the charges spaced at 2-foot intervals and each hole was loaded with one pound of 50 per cent du Pont nitroglycerin dynamite. Then, at right angles to the center line, cross rows were placed at intervals of about 6 feet and the holes in the row spaced at 2 feet. One stick of 50 per cent dynamite was placed in each hole and the entire group fired by the propagation method. This blast thoroughly disintegrated the surface mat to the width of the proposed fill, about 50 feet, and so mixed the muck and water that a soupy consistency was obtained which allowed the fill material to settle to the bottom. For depths ranging up to 4 or 5 feet complete settlement was obtained by this method.

As the deeper portion of the swamp was approached, settlement of the fill slowed down and additional blasting was necessary. The surface mat was broken up by cross-section blasting but slightly heavier charges were used in order to liquefy the peat and the muck to greater depths. In addition, there was blasted on each side of the right-of-way a ditch about 4 feet in depth and these ditches served to relieve the pressure under the fill.

As the fill was put in place, using the end-dumping method with the nose of the fill carried forward in a wedge, the weight of the embankment forced the unstable material laterally and this "boiled up" in the relief ditches. The wedge shape of the fill forced the muck and peat to the sides. This procedure was continued as long as the embankment settled of its own weight. When the subsidence stopped, the front of the fill was built out nearly square. Five charges of dynamite were placed about 15 to 20 feet in front of the fill. Usually a 50-pound box of dynamite was distributed in holes spaced at 10-foot intervals and about two-thirds of the depth of muck. For this blasting 40 per cent special gelatin was used with very satisfactory results. These holes were individually primed with electric blasting caps connected in series. As this blast was fired, the pressure was relieved in front of the fill and its weight forced the unstable material into the cavity thus created. Settlement as great as 4 or 5 feet followed and more filling material was carried forward on the grade until it was necessary to place and fire another charge, usually a distance of about 25 or 30 feet. It was also necessary to clean out the lateral ditches in order to allow the under pressure to push out the muck. Settlement was obtained to a depth of 22 feet on this job using this procedure.

It is important that the surface mat be broken for at least 100 feet in advance of the fill so that the unstable material may be forced ahead and to the sides; also that the lateral ditches be kept open well in advance of the nose of the embankment. In planning relief shots to advance the fill, the charges should be placed

Pushing the Road through a Cranberry Marsh in Washington. This View Shows Ramping of the Fill after the Sod Mat Was Broken by Blasting. Note the Lateral Ditch at Left Center.

far enough ahead so that dumping material will not flow over the remaining muck on the hard bottom. The distances in this case were found to be satisfactory, but local conditions may require a greater distance. After each blast the line of demarkation between the muck and the fill material was very distinct, showing that no overlapping had taken place. The State Highway Department had a checker on the job at all times to ascertain by soundings if the settlement was complete and to determine the blasting procedure in this respect.

This work was somewhat unusual in that it combined practicably all fill-settlement methods in one operation. The procedure outlined, called the "relief method", is advantageous because the contractor's only time loss occurs when a shot is being fired. All the charges fired are relief loads. No shots are fired under the fill or after it is in place. The charges of dynamite, too, are smaller, which results in a cheaper explosive cost per yard.

Another Example of the Relief Method

Another interesting application of this method was on the Forest Line South job near Republic, Wash., where the Max J. Kuney Co. of Spokane, Wash., had to carry a fill through a marsh which was covered with an exceptionally heavy growth of grass underlaid with peat ranging in depth from 9 to 39 feet. Before it was decided to proceed with fill-settlement work, some of the fill had been put in place and was floating on the surface mat. As this work continued to the deeper portions of the marsh, the weight increased, the fill broke through and some settlement was obtained naturally. The amount of fill material at hand was used up and only a small part of the work had been completed.

Before advancing further, it was thought best to settle that part of the embankment already in place. Lateral ditches were blasted, using two 1⅛ x 8-inch cartridges of 40 per cent special gelatin and one cartridge of 50 per cent straight nitroglycerin dynamite, the latter to insure propagation. Soundings were then taken to determine how much of the fill was in place and also to ascertain the depth of muck remaining. Attempts were then made to blast under the embankment, but these were not successful because the presence of large boulders made vertical holes impossible.

W. W. Singer, Resident Engineer, State Highway Department, then directed that holes be placed at an angle under the fill. Extreme care was exercised to load the charges at the right places. The first loads were spaced on 10-foot centers down the center line and about two-thirds of the way through the muck. About four pounds of 40 per cent du Pont special gelatine was used per foot depth of muck. This dropped the central section after which the fill was brought to grade. Then a second row, with charges of approximately the same size, was placed about 10 feet from the center line on each side. This second blast forced more muck from under the fill which was again brought to grade. A third row was placed on either side of the fill about 10 feet from the second one. These were loaded with about two pounds of dynamite per foot depth of muck. This last blast entirely removed the muck from under the embankment which was again brought to grade.

Loading the holes through the muck at angles, rather than through the fill, saved considerable time and equipment. It also enabled the contractor to continue grading without being hampered by equipment on the fill.

After the fill had settled, the relief method was resorted to where necessary. The deepest point in this marsh was 39 feet, but complete settlement was obtained. In such sections two boxes of dynamite were placed in holes ahead of the fill.

Material and illustrations for this article were furnished through the courtesy of *Du Pont Magazine*.

Vibrated Concrete Pavement

In order to compare vibrated with unvibrated concrete, a test section of pavement was laid on U. S. Route 30 North in Crawford County, Ohio. The regular mix called for 6.3 sacks of cement per cubic yard of concrete, the slump to be not over 2½ inches. The aggregates were crushed limestone and limestone sand hauled from a central batching plant to the mixer. The vibratory finisher, arranged so that the screeds could be vibrated or not vibrated at will, was used ahead of the ordinary finisher on the test section. The remainder of the job was finished with the ordinary finisher. The concrete was finished as follows: 7,204 square yards with the ordinary finisher, 5,091 square yards by the vibratory finisher with vibrators working and 2,213 square yards with the vibrators not working. Cores were cut from the vibrated and unvibrated concrete at seven and twenty-eight days and tested the same day as cut.

The use of the vibrator made it possible to use a drier mixture than with the regular finisher. According to an unpublished report by R. R. Litehiser, Chief Engineer, Bureau of Tests, Ohio State Highway Department, this is the probable reason for the greater compressive strength in the vibrated concrete. The average compressive strength of the vibrated concrete was 13 per cent above the regular concrete strength. The vibrator made spading along the forms unnecessary and there was no objection to the vibrated concrete by the laborers who placed and finished the concrete.

The Use of Timber Connectors

An informative booklet on split-ring and toothed-ring timber connectors, the use of which is quite common in Europe but comparatively new in America, has recently been issued by the Timber Engineering Co., agency of the American Forest Products Industries for handling the distribution of the connectors. The booklet has an adequately descriptive text accompanied by illustrations showing how connectors are applied to structural members in timber construction and how the latter are assembled into towers, bridges, platforms and similar structures. Copies of this booklet may be secured gratis from the American Forest Products Industries, 1337 Connecticut Ave., Washington, D. C.

Beating Wet Weather *on* Levee Enlargement

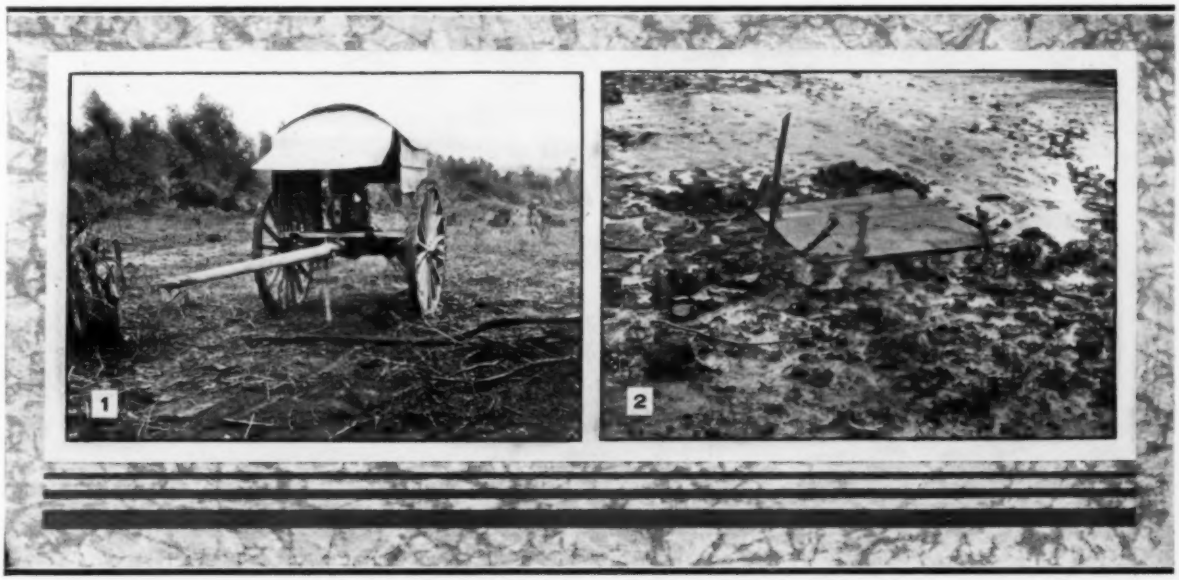
Highways Construction Co. Completed 300-Day Contract in 90 Days

NOT too well favored by good weather, but during an extended period of low water, the Highways Construction Co. completed the enlargement of 6 miles of old levee at Philadelphia Point near White Castle on the west bank of the Mississippi River, about 25 miles below Baton Rouge, La. The contract for moving 940,000 cubic yards of dirt was awarded for 12.40 cents per yard or a total of $116,560. Work was started May 9, 1934, with a Bucyrus-Monighan 61-50 machine with a 150-foot boom and an 8-yard Yaun dragline bucket. Three days later a Bucyrus-Erie steam dragline, Class 24, with a 115-foot boom and a 4½-yard Yaun bucket was started. These two machines averaged 10,000 yards per 24-hour day.

Large Labor Organization for Clearing and Grubbing

As there was a large amount of clearing and grubbing on this job, the contractor chose to remove all obstacles to rapid advance with the machines by doing all the preliminary work at once with a large hand labor organization aided by teams and tractors. About 250 men were put to work pulling out trees and giving the ground a chance to dry out in the sun after the frequent rains of the spring.

All labor was hired through the National Reemployment Service without discrimination between white and negro labor. The contractor was given a certain quota of men but, by doing the clearing and grubbing as a wholesale job, he asked for far more men than allotted,



"ACCESSORIES BEFORE THE FACT"—OF LEVEE BUILDING

1. A 1,500-watt electric plant made portable for all conditions by mounting on a pair of large wagon wheels. 2. A subsidence plate, 5 feet square, of planks covered with roofing paper. These inexpensive plates replace the earlier $7 steel plates and are just as effective.

thus creating a very friendly feeling with the local administrators of the NRS who showed unusual care in the selection of the men, eliminating those totally unfitted for the work and thus saving the contractor considerable time in discharging unsuitable labor. The only hand labor on the actual levee construction was for spotters and hand graders.

This contractor formerly worked his men 6-hour shifts with three crews for each machine. Thus the first crew went on at 6 A.M. and worked until 12 noon and then returned 12 hours later for its next shift. This gave all the men hot meals in the camp at approximately 6 A.M., 12 noon or midnight, and 6 P.M. Under the present alignment with NRA regulations, he worked the men 8-hour shifts. They always had the same watch and took one meal on the machine. This meal was sent out hot in containers to the machines at the proper times. Under this scheme the operator on the machine was busy eating instead of supervising the greasing of the machine at the times noted later in the article.

MACHINE OPERATIONS

The operating crew of the Monighan consisted of the following for each shift: operator, engine man, greaser, one spotter, ten hand graders, except when the two machines were operating close together and then the number of graders was reduced to four. The Monighan has a reach of approximately 162 feet from the center and so placed the material that there was no rehandling.

SUCCESSIVE OPERATIONS IN LEVEE ENLARGEMENT NEAR WHITE CASTLE, LA.

1. *The top of the old levee prepared for enlargement and showing the pit at the left.* 2. *A small pump operated by an outboard motor used for draining the pit.* 3. *A walking dragline building the enlargement.* 4. *Walter P. Villere, who took personal charge of this contract.* 5. *The widened section before topping.* 6. *The steam dragline which ran on the berm and did the topping. Note the large floodlight on the levee for night work.* 7. *A long section of finished levee.*

The power plant for the Bucyrus-Monighan was a 300-hp Fairbanks-Morse diesel engine.

The material on this job was a sandy clay with little shrinkage but the usual 25 per cent allowance was required. There were strata of a material that looked like gumbo clay but examination showed that it was a very fine clay only slightly coarser than the quicksands and, in fact, it acted much that way if wet.

The Monighan carried no cleats on its pontoons as it was necessary to work on mats from time to time and the cleats destroy the mats. Where the material was soft, logs from 4 to 6 inches in diameter and 10 feet long were laid transversely along the path of the pontoons to give the added support and prevent sliding of the pontoons.

At regular intervals and at least once in each station and also wherever required by the Inspector, the contractor laid 5-foot square "plates" of plain planks covered with roofing paper. These replace the earlier steel plates which cost about $7 each and are used to measure subsidence by boring down to them after the levee has been completed.

The second machine, the steam-powered Bucyrus-Erie dragline, operated over a radius of about 125 feet and had the following crew for each shift: operator, foreman, oiler, two track men, pump man, one or two spotters and two or three graders. This machine ran on tracks of three 4 x 12-inch oak planks carrying rollers of fence posts. Whenever the track became wet and hence slippery, hot cinders were thrown out ahead both on the track itself and on the ground, drying them quickly and also giving a grip on the track. This machine is best adapted to soft ground and moves itself ahead by throwing the bucket out and pulling the machine forward on the rollers and track.

When it was not easy to deliver the coal for the machine by team, it was spotted in a bucket on top of the levee and lifted by the long boom down onto the ground near the machine from which position it was lifted by the rear hoist.

Inasmuch as this second machine ran along the berm, the Monighan laid up dry dirt for that particular section. The contractor's careful selection of material for the berm was a great factor in permitting the operation of the second machine at times when similar machines on other operations were shut down and losing valuable time.

A Lorain 55 dragline was used to cut the search ditch ahead of the enlargement operation. Where water filled in the ditch, which measured 5 feet deep and 5 feet wide, an Evinrude pump was quickly installed to pull out the water.

Two Caterpillar Sixties were used on the work to pull stumps and snake logs for the Monighan when needed.

Lighting Equipment for Night Work

To supply illumination for the regular night work, the Monighan had a 12,000-watt General Electric plant and the Bucyrus-Erie steam plant carried a Moon steam generator of 3,000-watt capacity. To supplement the smaller steam plant, a Kohler 1,500-watt plant mounted on a 2-wheel trailer was carried nearby and a similar unit was installed at the contractor's camp.

Lubrication Schedule and Methods

All machines were greased four times a day. They were stopped at 8 A.M. when the operator went onto the machine and they were greased also at 12 noon, 8 P.M. and midnight. The contractor uses any standard brand of grease, buying without favor from any one of the major companies manufacturing high grade lubricants.

For fueling the Monighan at noon one of the Caterpillar tractors pulled ahead the 425-gallon oil tank so that it was close to the machine which can readily pump its own fuel supply to the machine fuel tank.

Personnel

The Highways Construction Co. of New Orleans, La., contractor for the Philadelphia Point enlargement project, consists of C. B. Henritzy, President, Walter P. Villere, Secretary-Treasurer, and E. A. Schyot. This contract was in charge of Mr. Villere. For the Second New Orleans District, U. S. Engineer Office, Lieut. Col. J. N. Hodges, District Engineer, the work was in charge of Frank Love and R. A. Broussard, as Inspectors.

Interesting Test for Pavement Materials

A SERVICE test has recently been developed for pavement materials which can be made conveniently under controlled conditions of temperature, moisture, subgrade and traffic. It consists of a 14-foot diameter circular track in which pavement sections are laid and then subjected either to the action of a roller or to a pneumatic-tired wheel which may be equipped with tire chains, if the resistance of materials to this type of action is desired.

Several tests have been carried out indicating the versatility of the machine. As a result of investigating the stability of aggregates, it was indicated that the gradation of the aggregate influences the stability of a layer of material subjected to rolling loads and that stability of a thin layer may be increased by using a gradation in which the maximum size of the aggregate approaches the compacted thickness. The conclusions of the study on stone screenings as a blanket layer under macadam were that when a macadam road is built on a clay subgrade. it is a wise precaution to use a blanket course of screenings 1 to 2 inches in thickness, before laying the coarse stone. With a subgrade of extremely finely-divided clean sand, the layer of screenings may not be efficacious.

These and other tests were described in a paper presented by Messrs. Goldbeck, Gray and Ludlow of the Bureau of Engineering, National Crushed Stone Association, Inc., before a session of the annual meeting of the American Society for Testing Materials in June. Copies of this paper may be secured from the Society, 260 South Broad St., Philadelphia, Pa. Price: 25 cents per single copy.

A Thing Money Can Not Buy

THE creation of the human eye can not be bought for all the money in the world! Our eyes are engaged in very serious work when we are awake, 70 per cent of all body movements being to some extent guided and controlled by what we see. One fourth of our basic body energy is consumed in the task. Because of this it is vital that everyone should understand the importance of good eyesight; the need for protecting it; the desirability of assisting poor vision with properly fitted glasses; and the necessity of using the eyes at all times as a guide to our movements, so as to minimize the hazards of slipping, tripping or striking against objects.

Many construction operations require some form of eye protection. Besides the obvious hazards of flying particles, there is exposure to arc welding operations, dust, brilliant sunlight. There are on the market today many kinds of goggles to meet the various requirements of the hazardous occupations and there is no longer any excuse for failing to protect the eyes.

The Lubrication *of* Crushing and Screening Equipment

The Tenth of a Series of Articles on an Important Phase of the Maintenance of Construction Equipment

THE lubrication of stone crushers presents a subject which is more complex than is generally believed, if the maximum of efficiency is to be maintained at a minimum cost of upkeep. An exceptionally heavy duty is imposed on crushers and they operate under unusual conditions. Invariably fine dust permeates the air and care must be taken to exclude it from the bearings as far as possible. The manufacturer has endeavored to build his crushers with a view to preventing dust from entering the bearings and circulating systems but it is practically impossible to accomplish this entirely, considering the nature of the work the crusher performs. However, most manufacturers have equipped their tanks or reservoirs with screens through which oil passes. These screens gather the greater portion of the foreign substances suspended in the oil and purify it to a considerable degree before again passing through the circulating system. Others have designed settling tanks in conjunction with reservoirs which are very successful in the purification of the oil.

The pressure imposed on the bearings is intermittent and excessive, creating a tendency to overheat to an unusual degree when inefficient lubricants are used.

There are various types of crushers, each of which is used for a given purpose, and include gyratory crushers, jaw crushers, cone crushers, etc. Regardless of the style or type, the similarity of purpose for which they are intended has simplified their lubrication to a considerable degree, insofar as the variety of lubricants required is concerned.

The operating parts have been confined to the least possible number and, therefore, the number of bearings necessary are in proportion. They are built for continuous operation at heavy duty and of necessity are massive and sturdy to withstand excessive pressures and shocks incidental to crushing and breaking various kinds of material.

Engineers have made an exhaustive study of the subject of proper grooving of bearings that the lubricant may have extensive and proper distribution over bearing surfaces. Improper grooving invariably causes the failure of an excellent lubricant to function properly, resulting in overheating of the bearings and their excessive wear, increased friction and power consumption. When crushers are overhauled and bearings relined, the

Change to Winter Lubricants!

During the warmer summer months, heat-resisting lubricants are advocated for use in all outdoor equipment, especially crankcase oils and gear lubricants, which are usually affected by temperature conditions. Such products generally have very good lubricating properties and the inclination is to continue their use during the late fall and winter seasons. Frequently such lubricants have high cold tests and are not adapted for use at the lower temperatures as their tendency to congeal is likely to cause considerable trouble when exposed to the cold. Such lubricants should be changed as soon as the temperatures reach 30 to 35 degrees F. and low cold test lubricants substituted. When a certain brand of crankcase oil has proved entirely satisfactory during the summer months, frequently a lighter grade of the same oil will meet the requirements of the winter season. Regardless of the grade selected, it should possess a cold test no higher than 15 degrees above the minimum temperature at which the engine will operate. The lubricant used in gear housings during the winter months should have a maximum pour test of at least 10 degrees F. above zero to insure against channeling which leaves the face of the gears dry and exposed to excessive wear if not complete destruction. Pressure and cup grease lubricants usually possess a sufficiently low cold test as to permit the same consistency to be used during all seasons of the year. It is most important to the operating efficiency and preservation of your equipment to change lubricants at this time.

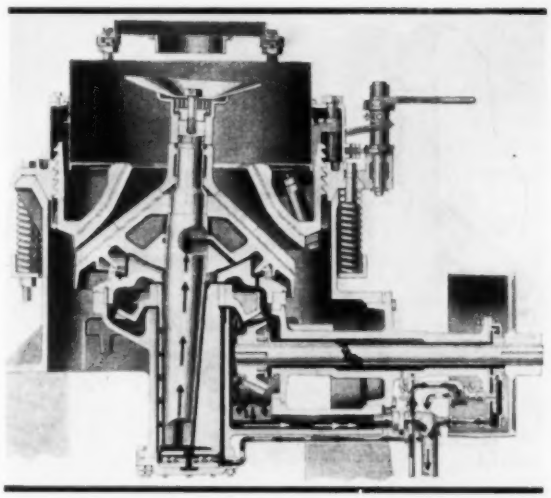
original grooving design should be followed to insure efficient operation after being assembled. When reassembling the crusher after overhauling, each bearing part should be thoroughly covered with lubricant to insure instant lubrication when the crusher resumes operation. This is very important.

JAW CRUSHERS

Jaw crushers are rock breakers and are generally used for primary crushing. It is a machine of simple design with a rough and ready appearance which usually operates in very dirty surroundings and is quite generally subject to a great deal of abuse. For these reasons there is a general but entirely erroneous impression that but little care need be exercised in its operation. Regardless of external appearances, the internal mechanical parts are very carefully machined and accurately fitted and are deserving of the best possible care to obtain efficient operation.

Different makes of crushers of this type have varying methods of applying lubricants to the bearings. Some of the more modern machines are equipped with a self-contained, automatic-pressure lubrication system which supplies a grease lubricant to all bearings as needed. Others are equipped with compression grease cups of the hand or spring automatic types, while still others have open slot boxes on the housings of the more accessible bearings with grease cup installations for other bearings. The first mentioned system is quite ideal as it requires less attention on the part of the operator since the feed is automatic and controlled by regulating valves, assuring the proper amount of lubricant to each bearing as required. For this system a grease lubricant of a No. 3 consistency should be used. For compression cups a No. 4 density may be used as it can be easily dispensed and carried to the bearings

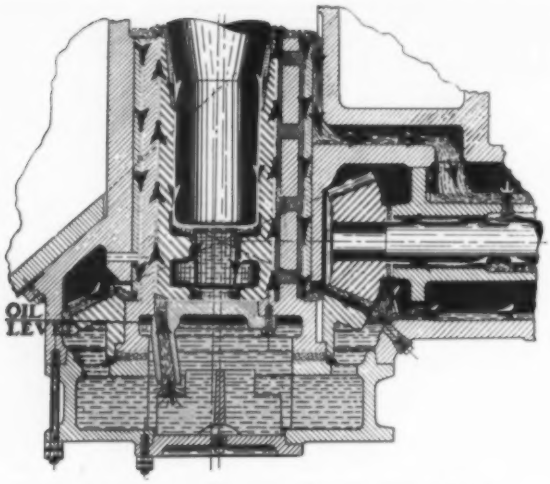
A Telsmith Rock Breaker in a Typical Plant Set-Up Showing the Conditions of Dust and Dirt Under Which Such Equipment Operates



The Automatic Lubricating System of a Symons-Nordberg Cone Crusher

through the medium of these cups. Ordinary cup greases may be used for the lubrication of these machines equipped with the systems mentioned but, as such lubricants are usually manufactured with low viscosity oils and mediocre base materials, they do not possess the pressure-resisting or lubricating properties of the better grades of greases which are made with viscous oils and the better quality of base materials. Not only will the consumption of the former be far greater than the latter type but, owing to the difference in the lubricating values, it will be necessary to rebabbitt the bearings at more frequent intervals, incurring additional labor and material expense.

Crushers equipped with open boxes may be efficiently lubricated by different methods and types of lubricants. Wool yarn saturated with a good grade of heavy oil may be packed in the boxes against the shaft, or the wool yarn may have a good grade of grease lubricant incorporated. When the former is used it is necessary to replenish with oil at frequent intervals and this practice should not be neglected. If a grease lubricant is used in conjunction with wool yarn, the yarn should be turned over from time to time to prevent glazing or carbonization where it is in contact with the shaft and the wool replenished with additional grease as may be required. If the bearings are operating at comparatively high temperatures, it is advisable to use a sodium-base grease of the fibre or sponge type, which has greater heat-resisting properties than the calcium-base type of greases. What are known as block or brick greases are proving very satisfactory for these types of bearings. The blocks are cut to fit loosely in the boxes and they rest directly on the shafts. The melting point of block greases varies according to their construction and methods of manufacturing. Different makes or types have melting points ranging from 250 degrees F. to 600 degrees F. Selections should be governed by the normal operating temperatures of the bearings, using a lubricant having a melting point of from 30 degrees F. to 60 degrees F. above the maximum bearing temperature. In selecting a block grease, consideration should be given to its oiliness. Some block greases are much oilier than others, as may be noted by



The Lubricating System of a Traylor Bulldog Gyratory Crusher

passing the palm of the hand lightly over the surface. A perceptible film of oil will be imparted to the hand though no great pressure is exerted. Such a lubricant does not require a high temperature to function but at the same time it may possess a comparatively high melting point. The drier types require contact with heat commensurate with its melting point before it supplies sufficient lubricant to the bearing to lubricate it efficiently. This method of lubricating bearings of the type mentioned is economical and very dependable. Regardless of the method adopted, care should be exercised to have the cover of the box fit closely to prevent the entrance of dust or abrasive matter which would contaminate the lubricant.

Gyratory Crushers

Practically all gyratory crushers are lubricated with a fluid lubricant which is carried to all the working parts or bearings by means of rotary pumps or similar devices, or by an automatic system assisted by capillary attraction. A difference of opinion exists among designing and construction engineers as to the type of fluid lubricant to be used in these units. Many recommendations are made with the view only of keeping the crusher in constant operation, without thought to ultimate consequences, such as frequent rebabbitting of bearings with the resultant loss of production while such repairs are being made. All are agreed that ordinary black oil should not be used for this purpose as it does not possess the necessary lubricating properties for such severe service and requires frequent changing. The low price of such an oil is very attractive to many operators who are inclined to be influenced by first costs, without consideration of rapidly deteriorating bearings and excessive quantities of lubricant consumed.

The manufacturer's engineers are frequently influenced in their recommendations by the refiner's lubricating engineers. This is evidenced by a list published by one manufacturer of gyratory crushers, containing the recommendations of fourteen oil companies for the lubrication of a certain crusher. Each advocated the use of a specific oil of their manufacture but there was a variance in the viscosity of the oils they suggested, ranging from 180 viscosity at 100 degrees F. to 1,050 viscosity. Owing to the excessive pressure per square inch of bearing surface, the lubricant should be of sufficient body to prevent metal to metal contact but it should not be so viscous as to prevent its being handled freely through the circulating system, resulting in a sluggish feed to the bearings. The oil should be of the best quality obtainable, regardless of the first cost. The better grades of oil reduce wear to a minimum, eliminating the possible necessity of frequent overhauling and repairs. The quantity of lubricant required to fill the oil tanks or reservoirs of machines varies with the size and make of the crusher. The capacity of the reservoirs of the larger sizes of gyratory crushers will approximate from 250 to 550 gallons. When reservoirs are equipped with cooling systems, they may be filled to capacity; otherwise they should be filled to not more than 75 per cent of capacity to allow for expansion of the oil occasioned by absorption of frictional heat from the bearings.

In addition to oils for the lubrication of gyratory crushers, there have been developed fluid grease lubricants which have proved very satisfactory on many large installations. They are manufactured with oils of about 500 viscosity at 100 degrees F. carrying about 3 per cent calcium base. The operators who have adopted this type of lubricant have stated that it lasts two to three times longer than the better grades of oils and a lesser quantity is required for replenishing between changes. One engineer operating one of the largest gyratory crushers in this country claims that when using a good grade of oil it was necessary to overhaul and rebabbitt his crusher every three to four months, at which time the lubricant was changed. Since adoption of the fluid grease lubricant it has been necessary to shut his crusher down but once every twelve months for a general overhauling. He maintains that his lubricant is an investment rather than an expense as the cost of his lubricant is saved many times over in continuous production and the saving of labor and materials for repairs. This particular crusher operates continuously 24 hours a day.

A lead-base fluid lubricant has also been adopted by several concerns who make exceptional claims as to its efficiency and economy. They claim that it prolongs the life of bearings, and the amount of lubricant consumed is practically negligible. This type of lubricant should be selected with great care and should be obtained from a reputable manufacturer to insure against a poorly-made product which would have a tendency to separate.

Cone Crushers

Cone crushers are invariably constructed for oil lubrication and are equipped with oil pumps which carry the oil from the storage tanks to all bearing parts of the crusher, it being returned by gravity to the tank. The oil should be of a good grade of about 500 viscosity at 100 degrees F. Disc crushers, both vertical and horizontal, are lubricated in the same manner and the same grade of oil is used.

Screen Lubrication

The lubrication of screens, whether the vibrating or

rotary type, has been simplified by the standardization of the roller or ball bearings, or the plain sleeve type of bearing. The former requires a high-grade grease lubricant of a consistency to conform with the system used to introduce the lubricant to the bearing. When equipped with pressure fittings, the regular pressure density should be used. If compression grease cups are employed a No. 3 density should be used. On equipment of this character which have plain bearings, a well-made cup grease of the ordinary type may be used with satisfaction.

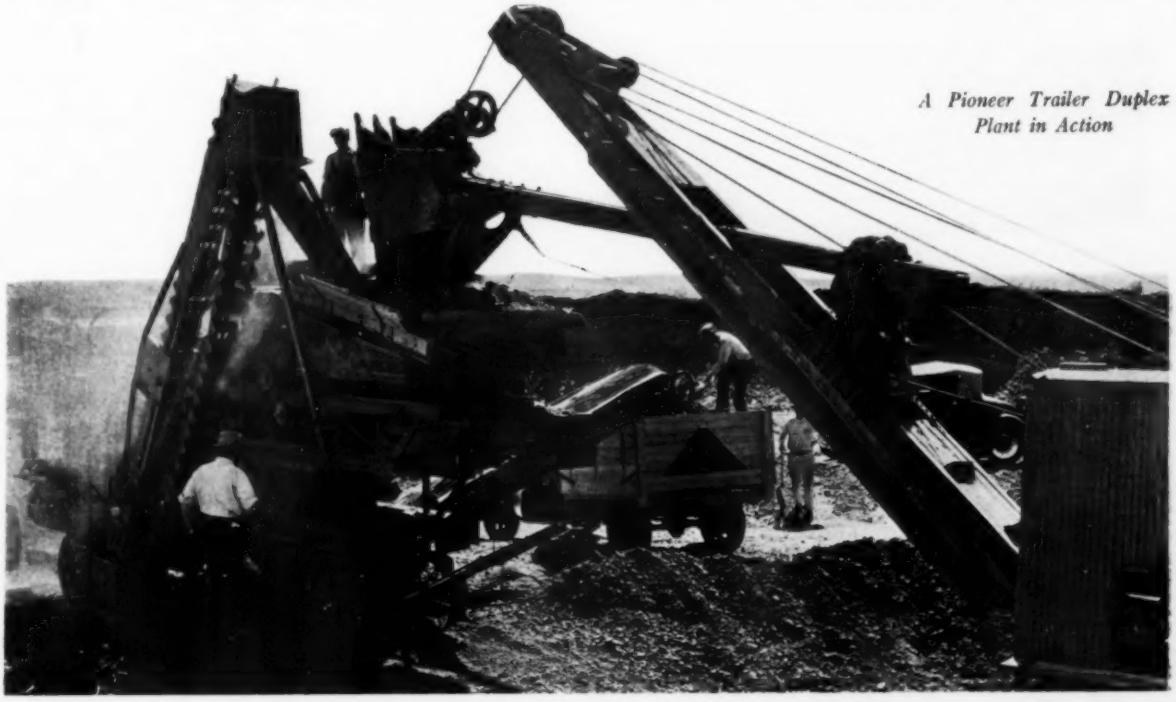
THE LUBRICATION OF CONVEYORS

The majority of modern conveyor idlers are of the roller-bearing type and invariably have a pressure system installation. These require a grease lubricant of the highest type and of a consistency which may be dispensed easily through the type of guns furnished for that purpose. These rolls usually have hollow shafts through which the lubricant is projected to the inside bearings. When applying the lubricant, care should be taken to see that it is carried to the inside bearings. The rolls should be tested daily to see that they turn freely. While material collecting underneath or at the ends of the rolls may cause them to stall or become sluggish, insufficient lubrication may cause this condition, resulting in the rapid deterioration of the belt passing over the stalled rolls. The lubricant must be of the calcium type to insure against its emulsifying and being washed away. It must be sufficiently well made to withstand the heat conditions of summer temperatures and sufficiently soft under winter conditions to prevent it from channeling. It should be absolutely free from corrosive matter, grit, rosin, waxes, talc, mica or fillers of any description.

Most of the older type of conveyor rollers are equipped with hand compression grease cups. These were not popular with the one responsible for the maintenance of these rolls as the frequent screwing down of the many cups and refilling them involved considerable labor and, therefore, were frequently neglected. Hand compression cups should be turned down at least twice daily when the operation of the conveyor is continuous and daily inspections made to ascertain if the rolls are operating freely. If cups are broken off at the shanks through the falling of material being conveyed, they should be replaced immediately.

INDUSTRIAL RAILROAD QUARRY CARS

There are a variety of types of journal boxes on quarry cars but the larger and more modern cars are equipped with the M.C.B. type of boxes which have the "under-feed" system of lubrication. These are usually packed with wool yarn or wool waste, which is saturated with a fluid lubricant and the wool is replenished from time to time as may be required. Occasionally cotton waste is used in place of yarn but this is not entirely satisfactory due to the inclination of the cotton to pack down or mat, preventing contact with the shaft and the bearing does not receive lubrication unless the box is continually flooded with the lubricant. Frequently, when wool is used for the purpose mentioned, it eventually becomes matted unless it is turned over and stirred up at intervals. A sufficient quantity of wool should be used to insure constant contact with the shaft that the lubricant in the bottom of the box may be carried to the journal through capillary attraction. Care should be exercised not to pack the box too tightly, creating a mass which would prevent the lubricant from passing through it freely. A light consistency of well-made fluid lubricating grease has been found to be most satisfactory for this purpose, though a good lubricating oil may be used. Frequently ordinary black oil is used owing to the attractive low price at which it is offered but, owing to its usual poor lubricating properties it is far from



A Pioneer Trailer Duplex Plant in Action

economical. as the inclination is to flood the boxes permitting its waste along the roadbed.

Probably the most efficient method of lubrication is by the use of a mixture of shredded wool and long curled horse hair, saturated with a lubricant such as mentioned above. The hair content makes the combination elastic or resilient and it is less inclined to mat. A lesser quantity may be used in packing the boxes with assurance that it will maintain its contact with the journal even when cars are passing over rough roadbeds. It is practically indestructible and may be readily cleansed with kerosene or gasolene, should it become impregnated with road dust or other deletorious matter, and be used over and over again.

Quarry cars equipped with ball and roller bearings should be lubricated with a high-grade grease lubricant, free from any acid and of the consistency of a good pressure lubricant. It is imperative that such a lubricant be free from any filler of any description, and it should not emulsify when it comes in contact with water or moisture.

Dynamite Data for New Users

NEW users of explosives should inform themselves as to the exact types of explosives for different applications and their efficient and economical uses. There are thousands of men today, unfamiliar with the uses of explosives, who are employed on road building and other public works under the PWA reemployment program. We give below brief descriptions of the physical characteristics of the various explosives in common use.

Gelatin 20 to 75 per cent is very water resistant, is very quick in action when confined and rather slow when unconfined. It is heavy and dense and has the greatest effective power per unit volume of explosive.

Straight Dynamite varies from 20 to 60 per cent gelatin, but is not often used in lower than 40 per cent strength, has good water resistance, but not as good as gelatin. It is the quickest of the commercial explosives and also the most sensitive. It is best adapted for mud-capping and ditch blasting by the propagation method.

Ammonia Dynamite or Extra Dynamite from 20 to 60 per cent gelatin is slower in action than the straight dynamite and less sensitive. It has a better heaving action in soft material like earth, clay, shale and sandstone, and is the most popular all-around high explosive used at the present time.

Low Density Ammonia Powders, sometimes called High Count, are somewhat similar to ammonia dynamites in physical characteristics but they do not stand water as well.

Free Running Powders are made in four strengths and are excellent for loading in sprung holes, provided the holes are dry. Their water resistance is very poor but they are excellent for soft materials, and where small sized drills only are available and where the holes are sprung.

Black Blasting Powder is the most economical of all explosives where it can be used. It has greater heaving action than high explosives but must be loaded only in absolutely dry work. In large charges it is best fired with a primer of straight dynamite.

For through cuts in highway work, experts suggest quarry gelatin for wet outside work, higher strengths for hard rock and lower ones for soft rock. If the holes are not particularly moist, an Extra dynamite is suitable. For deep holes in fairly dry work, the free running blasting powders and granular loose dynamites are economical to use.

In side-hill cuts, hard rock should be blasted with quarry gelatin, softer materials with grades of Extra dynamite and, if dry, with a free running blasting powder or granular black powder. In working from the side, if the excavated material is to be used for filling, the loads should be barely heavy enough to break the ground sufficiently for convenient handling, according to du Pont experts. In working from the end, the same explosives as for through cut work should be used.

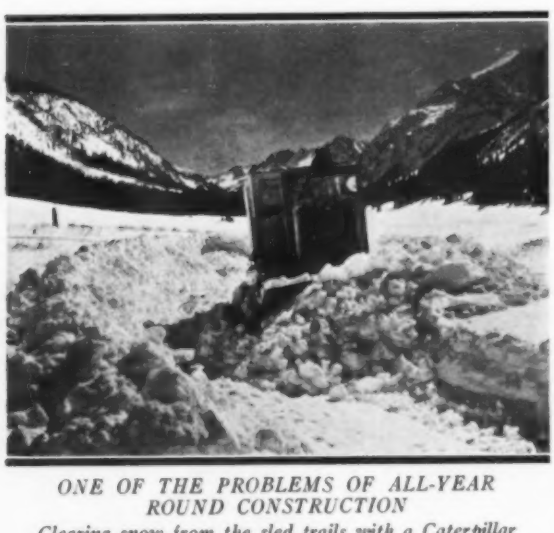
For earth side-hill cuts, it is advisable to loosen the earth with light blasts, as this will facilitate the handling of material with machines and make hand digging easier. Cuts can be widened and straightened and gravel blasted down with Extra 20 per cent dynamite, No. 2 free running blasting powder, or if dry with black blasting powder. If rather shallow holes are required, Extra 20 per cent or 40 per cent dynamite should be used, while heavier, deeper work calls for quarry gelatin for hard rock. For the latter, Extra grades of dynamite are also used, but if for dry work, free running blasting powder or granular black powder may be used.

In blasting to obtain grading material, as in a gravel pit, the spacing of the holes will be determined by the character of the material. Where rock is encountered, heavier loading must be practiced. The purpose of blasting is to loosen the gravel or earth banks to enable steam shovels to work faster, as the strain is reduced and less powder is required to operate the shovels. For such blasting, Extra 20 per cent dynamite or No. 2 free running blasting powder is suitable.

In fill settlement, dynamite may be used for removing unstable material from roadbeds and to make cavities for the fill to drop into as well as to stir up and liquify mud surrounding the cavities to permit rapid settlement of the fill. Ditching dynamite is particularly effective for fill settlement blasting, because of its water-resisting and propagating properties.

Although it is advised that technical men be consulted in order to determine the best methods for quarrying operations, general recommendations are made as follows: To prepare stone for crushing for road building, 40 per cent Extra dynamite, a low density ammonia dynamite, quarry gelatin, or a 60 per cent special gelatin or its equivalent is used. For quarrying dimension stone, use blasting powder of fine granulation to start cracks and seams in desired directions and for extremely hard rock, quarry gelatin should be used.

It is recommended that the explosives experts of the company from whom the dynamite is purchased be consulted in all cases where there is any doubt as to the amount, type or method of using explosives.



ONE OF THE PROBLEMS OF ALL-YEAR ROUND CONSTRUCTION

Clearing snow from the sled trails with a Caterpillar diesel Fifty and a Le Tourneau bulldozer on the Twin Lakes, Colo., water diversion tunnel project near Aspen, Colo., for which Platt Rogers, Inc., is the contractor. The trails must be kept clear of snow, which in some cases is 5 feet deep, in order to haul pipe 11 miles from Aspen to the tunnel.

Fleet *of* 28 Trucks Hauled Lime-Rock Base

Priming a Section of the Lime-Rock Base with Tar

Cornell-Young Co. Completed 12.9 Miles of Surface Treatment on Lime-Rock Base Between June 20 and October 1, 1934

BETWEEN Gray and Eatonton, Ga., on U. S. 129, a main highway north from Macon, Ga., Cornell-Young Co. of Macon, Ga., built a lime-rock base and surface-treated this improved base with an inverted penetration last summer in about 3½ months. The job was a State-Aid contract operating under the Construction Code as to hours and wages. Two shifts were worked 48 hours per week, each man receiving 40 cents per hour for common labor and skilled labor more, in proportion to its value to the contractor. Each shift worked 8 hours a day.

Preparing the Grade

Before the lime-rock base could be spread and rolled, the contractor had to prepare the grade for the new material. The old sand-clay base was broken up with a Killefer road ripper, pulled by a Caterpillar Sixty, and excess dirt, where in large volume, was taken out by a pair of Euclid wheel scrapers. The grade was then roughly cut to line with an Adams 121 grader, leaving it ready for the form work and fine grade crew.

Setting Forms and Fine Grading

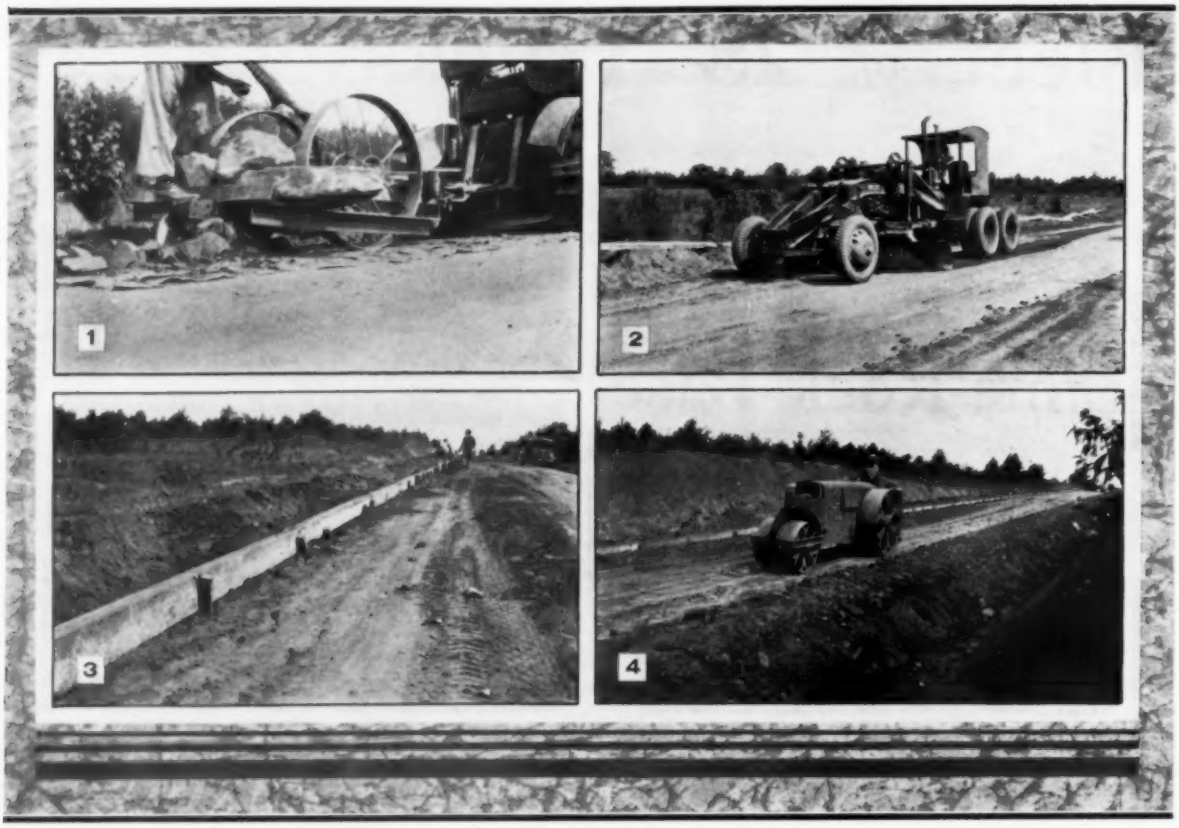
An Austin No. 77 power grader was used for cutting the side trenches for the heavy wood forms for the lime-rock base. These forms of 12-foot lengths of 3 x 8½-inch lumber were set on edge and staked to line and grade every 6 feet and at joints with 18-inch stakes cut from 3 x 3-inch stock diagonally. The form crew consisted of a foreman and six men doing all the hand work. The grader operator had one man on the ground checking all the elevations to see that the trench for the form was cut accurately. This same grader was used to cut the grade reasonably accurately to cross section ahead of the forms.

The fine grade crew consisted of from twelve to eighteen men cutting in and out as required to bring the grade to true shape as shown by a template made of 3 x 12-inch stock cut to the crown of the base and with plow handles at the ends to make the handling of the template easier. When the grade was accurate according to the template, it was rolled with a Huber 10-ton gas roller which ran between the forms.

Preparing the Lime-Rock Base

The lime-rock base was spread to a compacted thickness of 6 inches between the forms to a width of 20 feet. The base material was furnished by a commercial pit in Perry, Ga., and delivered by freight to Gray, Ga., 10 miles south of the end of the job, making the maximum haul 22.9 miles and the dead haul 10 miles on every load. The rock was unloaded at Gray with a Lorain 75 and 1-yard Erie clamshell bucket, handling an average of 26 cars a day and a maximum of 33 cars or 1,947 tons in 15 hours. On many days 30 cars were unloaded, accounting for 1,775 to 1,800 tons in less than 15 hours. The unloading track held only 15 cars and the railroad furnished only two switches a day. Each car of lime-rock spread about 85 feet of 6-inch compacted base.

A fleet of 28 trucks, all Mack and Boone trucks, hauled the material over a concrete road to the south end of the job and then over the prepared subgrade to a Blaw-Knox turntable operated by two men. The trucks then backed to the end of the base laid, and dumped on the grade. Two men kept just ahead of the



PREPARING THE SUBGRADE FOR THE LIME-ROCK BASE

1. *Breaking up the old sand clay base with a scarifier.* 2. *Cutting the side trenches for the heavy wood forms.* 3. *A line of side forms in place.* 4. *Rolling the subgrade ahead of spreading the lime-rock.*

dumping, cleaning out against the forms to insure a full 6-inch thickness of the lime-rock at the forms. Four men spread the rock by hand evenly across the road. The material was immediately rolled with a 10-ton Buffalo-Springfield gas roller to compaction. This first rolling left the material rather rough as it had only been spread by hand and not worked with any road machine. Immediately after rolling and before scarifying and shaping the lime-rock base, the wood forms were pulled and the edges of the lime-rock banked with dirt.

The next operation was to scarify the compacted rough base of lime-rock to a depth of 4 inches, trimming up the crown to a template with an Adams 10-foot grader pulled by a Caterpillar Thirty-Five diesel tractor. This smooth finished base was then rolled with an Austin 12-ton gas roller, leaving it as smooth as a concrete pavement at its best.

To help in working the lime-rock in the final compaction and for the final trimming, it was necessary to sprinkle it with water to soften it slightly. This was done with an 800-gallon sprinkler tank mounted on a Chevrolet truck and with hand control from the driver's seat for the sprinkler heads at either side. Water was supplied to the truck by a C. H. & E. triplex pump set up at a creek crossed by the new highway which delivered the water through a 2½-inch line to the bridge rail. It was found cheaper to run the truck back and forth along the grade as needed than to lay the pipe along the shoulder as is done for concrete work.

Priming the Lime-Rock Base

Just before the base was primed with tar, the contractor gave the compacted lime-rock a final blading to insure as perfect crown and cross section as possible and to take out any possible injuries that might have been inflicted by the contractor's own trucks using the road. The roadway was broomed immediately ahead of priming with a rotary broom pulled by a truck to remove the fine dust. This operation was repeated until all the fine dust, which might act as a blotter and take up the prime instead of letting it get into the surface of the base, was removed from the surface.

The tar, a coal tar fluxed with a tar base, was furnished by American Tar Products Co. in tank cars and unloaded at Warfield at the north end of the contract. The unloading and applying of the prime and the asphalt was done by the Southern Road Surfacing Co. of Miami, Fla., using a Kinney distributor mounted on a GMC truck. The tar was applied at the rate of 0.2 gallon per square yard, covering approximately 3 miles a day during the time that the priming was under way. The tar, which had a viscosity of 8 to 13, penetrated the compacted lime-rock base from ⅛ to 3/16 inch. Immediately behind the distributor two men broomed the tar prime to insure an even application and to remove any excess in any one spot. They also broomed

over any places where there was no application of the tar due to momentary plugging of a distributor nozzle.

The prime was allowed to dry out for 3 days or longer if necessary and then the road was opened to traffic to permit rolling of the base by the traffic itself. To force vehicles to use the entire roadway, portions of the road were blocked off, forcing traffic to the edges or to the center as desired. This curing under traffic was continued for 20 days.

THE INVERTED PENETRATION

The road was closed to traffic again after the 20-day curing period and swept thoroughly by the rotary broom to remove any loose material picked up by traffic or brought onto the road from side roads. Then 0.4 gallon per square yard of 180 to 230 penetration asphalt was applied by the distributor and immediately covered with 40 pounds of 1½ to ⅜-inch crushed gravel by spreader boxes to a depth of 1½ inches. This was broomed by hand to spread evenly over the entire surface of the road, and then rolled with a 5-ton tandem roller. The spreading was done by four men handling the spreader boxes and a crew of six men with hand brooms. The crushed granite was furnished by Weston Brooker of Camak, Ga., and delivered in trucks direct to the grade. Traffic was then allowed to use the road for 20 to 30 days. Then the road was broomed thoroughly to remove any loose material as the final work on the contract except for the trimming of the shoulders.

The contractor had a Ford flat-bed truck which was used as a utility unit throughout the work, hauling forms and stakes and other items such as tools and gasoline, oil and other lubricants for the shovel.

PERSONNEL

This 12.9-mile lime-rock and surfacing contract was awarded to Cornell-Young Co. of Macon, Ga., for $168,500. Work was started June 20, 1934, and completed shortly after the first of October, 1934. For the contractor, C. A. McIntosh was Superintendent, and T. E. Smith was Resident Engineer for the Georgia State Highway Department.

Time Is Money! Many contractors have discovered this, much to their sorrow, when they found their profits dissolved in the lost time and delays on the job. The first installment of an informative article "Are You Losing Profits through Lost Time?", containing suggestions on job management to eliminate expensive lost moments on asphalt paving contracts, appears on pages 38-40 of this issue. We recommend it to you.

We also call your attention to a feature article scheduled for the November issue, which describes the interesting material-handling methods used by TVA engineers in the construction of Norris Dam.

UNLOADING AND SPREADING THE LIME-ROCK

1. Unloading lime-rock from the gondola cars to the fleet of hydraulic-dump trucks. 2. Turning one of the trucks on the grade. 3. Spreading the rock from the tail-gate of the truck. 4. The sprinkler truck which was used in the final operation of grading the lime-rock base.

Are You Losing Profits

through

Lost Time?

Part I

Reported by
C. F. Rogers
Assistant Highway Engineer

IN 1926 the Bureau of Public Roads undertook a study of construction methods and costs on bituminous concrete highway projects. Twenty-three projects in seven states with an aggregate length of 150 miles were selected for study. The projects ranged in size from a minimum of 1,600 tons to a maximum of 49,000 tons. To facilitate comparison, actual mileages have been adjusted to mileages of pavement 20 feet wide and of equivalent area. The tonnage of material in base courses includes material used as a base in surface widening, full-width base sections on relocation, and the course ordinarily referred to as the leveling course and placed on the base. Surface courses include only top or wearing courses whether constructed on base of similar or dissimilar type. Averaging the figures for all projects results in an average project with a 20-foot surface, 5.15 inches of bituminous mixture, 6.5 miles in length and containing 3,141 tons of material per mile. This average project required 22,233 tons of material, but recent projects have required approximately 54,000 tons in 12 miles and 65,000 tons in 14 miles.

By far the greater number of projects studied consisted of surfacing laid directly on old cement concrete pavements, although a few surfaces were placed on new subgrade or on new cement concrete base. In all cases, except one, the surfacing was placed between side forms of wood, steel, or concrete and finished to these forms. All of the single-course pavements were laid on cement concrete base of a lean mix, and a thickened-edge section with curbs for lateral support. In the case of the one project where side forms were not used the base was made 1 foot wider than the surface course.

The mixes used include those commonly referred to as sheet asphalt, fine aggregate bituminous (or asphaltic) concrete, coarse aggregate bituminous concrete, and modifications of certain patented types of pavement on which patents are no longer operative. In the study of rates of production and costs, only those items directly related to the actual pavement are included and such items as subgrading, form-setting, and production of materials are omitted.

The projects were all of such size as to justify construction with a single plant set-up. In most cases the plants were located near the center of the job but factors such as the location of satisfactory sidings, space rentals,

TABLE 1.—LENGTH, THICKNESS, AND QUANTITIES INVOLVED IN PROJECTS STUDIED

Job No.	Length of 20-foot Pavement Equivalent in Area	Quantities Required			Surface Area	Quantities Per Square Yard			Quantities Per Mile			Number of Courses	Thickness		
		Base	Surface	Total		Base	Surface	Total	Base	Surface	Total		Base	Surface	Total
	Miles	*Tons*	*Tons*	*Tons*	*Square Yards*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*		*Inches*	*Inches*	*Inches*
1	8.28	16,294	9,458	25,752	97,104	0.168	0.097	0.265	1,968	1,142	3,110	3	3.25	1.79	5.04
2	9.09	18,877	9,954	28,831	106,653	.177	.093	.270	2,077	1,095	3,172	3	3.42	1.72	5.14
3	6.57	.....	5,599	5,599	77,082	....	.073	.073	.....	851	851	1	....	1.54	1.54
4	5.89	5,496	5,209	10,705	69,064	.080	.075	.155	933	884	1,817	2	1.55	1.42	2.97
5	13.94	17,134	21,392	38,526	163,504	.105	.131	.236	1,228	1,533	2,761	3	2.63	2.42	4.45
6	4.58	5,459	3,348	8,807	53,701	.103	.062	.165	1,192	731	1,923	2	1.90	1.17	3.16
7	4.40	6,967	5,961	12,918	51,672	.135	.115	.250	1,580	1,349	2,929	2	3.08	2.32	5.40
8	1.55	1,307	3,153	4,460	18,210	.072	.173	.245	843	2,034	2,877	2	1.65	3.52	5.17
9	6.59	15,353	7,733	23,086	77,332	.199	.100	.299	2,326	1,172	3,498	3	3.85	1.85	5.70
10	3.45	3,191	2,953	6,144	40,421	.079	.073	.152	925	856	1,781	2	1.53	1.38	2.91
11	6.26	8,934	9,724	18,658	73,457	.122	.132	.254	1,425	1,551	2,976	2	2.79	2.69	5.48
12	9.19	11,198	7,642	18,840	72,667	.154	.105	.259	1,809	1,234	3,043	3	2.98	1.99	4.97
13	2.75	.....	2,393	2,393	32,292	....	.074	.074	.....	870	870	1	....	1.50	1.50
14	1.41	.....	1,638	1,638	16,595	....	.099	.099	.....	1,161	1,161	1	....	1.99	1.99
15	2.29	3,946	2,252	6,198	26,831	.147	.084	.231	1,723	983	2,706	2	3.36	1.69	5.05
16	7.27	15,316	10,180	25,496	85,333	.180	.119	.299	2,107	1,400	3,507	3	3.48	2.20	5.68
17	4.34	4,286	3,862	8,148	50,925	.084	.076	.160	987	890	1,877	2	1.77	1.50	3.27
18	9.85	26,776	13,327	40,103	115,519	.232	.115	.347	2,721	1,355	4,076	3	4.49	2.13	6.62
19	12.20	29,680	19,270	48,950	143,162	.207	.135	.342	2 433	1,579	4,012	3	4.00	2.50	6.50
20	4.49	9,144	8,410	17,554	52,647	.173	.160	.333	2,037	1,873	3,910	3	3.34	2.96	6.30
21	9.63	26,238	13,447	39,685	112,992	.232	.119	.351	2,725	1,396	4,121	3	4.49	2.20	6.69
22	8.62	21,593	12,163	33,756	101,151	.214	.120	.334	2,505	1,411	3,916	3	4.13	2.22	6.35
23	9.89	29,823	15,733	45,556	115,984	.257	.119	.376	3,019	1,590	4,609	3	4.97	2.20	7.17
Weighted average	6.50	12,044	8,382	22,233	76,274	.158	.110	.268	1,853	1,289	3,142	.....	3.11	2.04	5.15

A Study of the Factors Resulting in Time Losses in the Construction of Mixed Bituminous Pavements Made by the Division of Management, U. S. Bureau of Public Roads

and accessibility made it desirable to locate some plants at a distance from the center.

TYPICAL PROCEDURE IN BITUMINOUS CONCRETE CONSTRUCTION DESCRIBED

Figure 1 shows the plan and elevation of a typical bituminous concrete plant. Aggregates are usually delivered by rail to an adjacent siding. From two to four separated sizes are delivered. The aggregate is moved from the cars to stockpiles from which the cold bucket-elevator is fed. At some plants the unloading is done by crane and at others the tracks of the siding are elevated, permitting bottom-dumping of cars and gravity feed to bins or piles. Gravity feed from bins to the bucket elevator with the flow regulated by control gates is frequently used. Belt conveyors are also used, particularly for the sand. The different sizes of aggregate

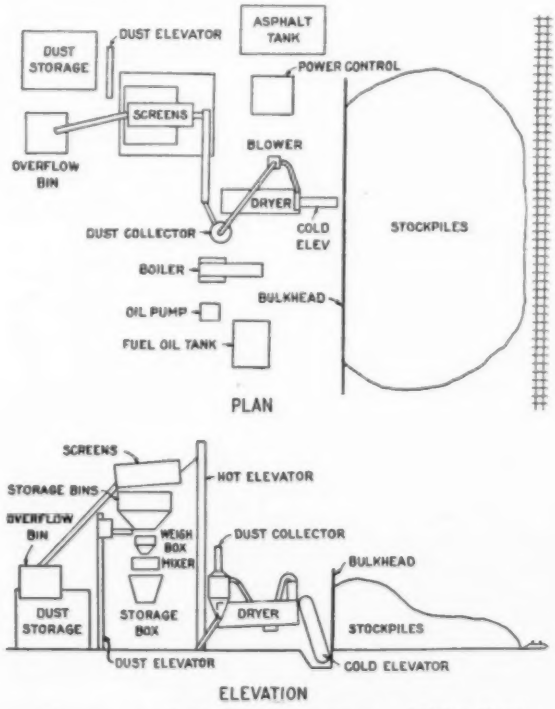
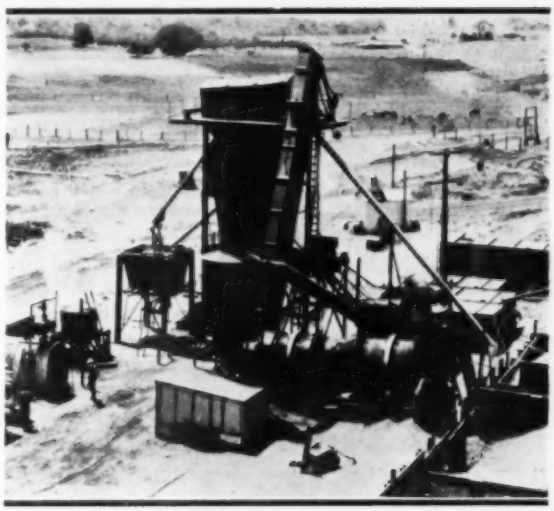


Figure 1. A Typical Arrangement of a Mixing Plant



A Well-Laid-Out Bituminous Concrete Mixing Plant

should be fed to the elevator in the proportions required for the mix as nearly as is possible.

The cold elevator hoists the material to the dryer for drying and heating. When this operation is completed the material is discharged by gravity to the hot pit beneath. At some plants, a blower and dust collector is used to by-pass the fine, dry material to prevent clogging the dryer. The fine material is wasted or deposited in the hot elevator pit with the larger heated aggregate.

An elevator raises the material from the hot pit to screens at the top of the plant where it is separated into the required sizes and then deposited in storage bins located over the weighing hopper. Where filler is used, it is generally conveyed from ground storage to a separate bin from which it may be fed by gravity or screw conveyor to the weighing box.

A boiler is used to furnish steam for heating materials and to operate the various power units. The boiler is usually heated by fuel oil which is stored in tanks and pumped to the boiler. Asphalt is drawn from cars and stored in a tank where it is heated by steam coils or tubes. The asphalt is pumped from the heating kettle or tank to the mixing platform on the main tower of the plant just above the pug mill.

A batch is proportioned by allowing each size of aggregate to flow into the weighing box in the proper amount as determined by weight. The aggregates are then dumped into the pug mill, which is in continuous operation, and the asphalt is admitted while the materials are being agitated. On completion of the mixing the batch is discharged through a steam-activated discharge gate to a storage box or directly to hauling equipment.

The mixed material is hauled to the road and deposited directly on the surface or in spreader boxes. It is then either shoveled and raked into place or it is spread with the spreader boxes. Following the initial spreading, the final spreading and raking is often done by hand but recently the mechanical finishing machine has to a large extent replaced hand finishing.

Rolling is done with a variety of types of rollers. Both the three-wheel and tandem type are used and weights range from 3 to 15 tons.

TIME DISTRIBUTION AND DELAY STUDIED

Although the plants studied varied somewhat in their arrangement, the particular functions of the various units were comparable. On every project there was a limiting unit or bottle neck, past which the materials could flow only in definitely limited amount. The removal of this bottle neck at one unit would only transfer it to some other unit which would then fix the rate of production. The purpose of the time study has been to derive the limiting rate for each unit or part of the plant and gradually to synchronize the several units by adjustment of size and speed or improvement of control of moving parts.

Stop-watch studies covering thousands of hours were made of repetitive operations, such as loading, batching, and mixing. Analysis of these data resulted in detailed information concerning operation cycles and capacity of each unit. An accurate record was kept of the cause and amount of all delays. Delay or lost time was classed as "major" or "minor." Major delays are definite stops in excess of 15 minutes and may occur during working hours or as a prolonged shut-down. Minor delays occur only during working hours under full expense and are usually of greater relative cost than major delays. They may be only a few seconds in duration but may recur frequently in cyclical operation. Study of stop-watch records for typical hours of operation indicated the extent of each kind of delay and comparisons were made on a percentage basis. It has been assumed that such percentages reflect the time distribution during all of the working hours. The correctness of this assumption has been checked by comparison with records covering protracted periods, and the error is found to be less than one tenth of 1 per cent.

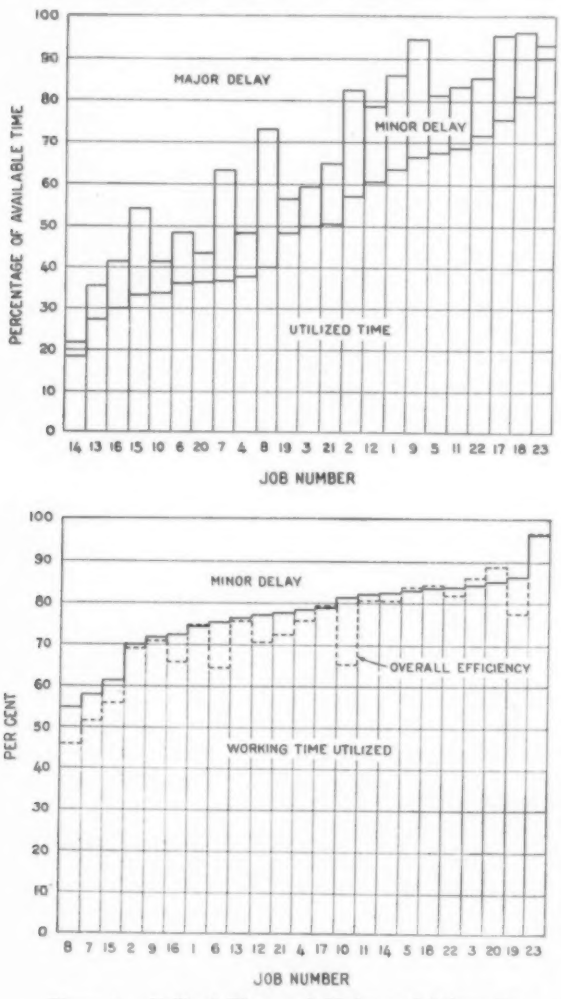

MAJOR DELAY
MINOR DELAY
UTILIZED TIME
PERCENTAGE OF AVAILABLE TIME
JOB NUMBER
14 13 16 15 10 6 20 7 4 8 19 3 21 2 12 1 9 5 11 22 17 18 23
MINOR DELAY
OVERALL EFFICIENCY
WORKING TIME UTILIZED
PER CENT
8 7 15 2 9 16 1 6 13 12 21 4 17 10 11 14 5 18 22 3 20 19 23

Figure 2. Utilized Time and Major and Minor Delays as Percentages of Available Time (Upper Graph) and Working Time Utilized and Overall Efficiency at All Plants

Job time or "available time" is based on the length of the average working day and the days of job duration with the exception of Sundays and holidays. The elimination of major delays from available time results in "working time" during which the full crew is always on the job. The subtraction of minor delays from working time results in "utilized time" during which the plant is operating at 100 per cent efficiency. In conducting the study both major and minor delays were classified as to causes and also as to whether they were avoidable, partly remediable by good management, or unavoidable.

Major delays resulting from fifteen general causes are responsible for the loss on all jobs of 4,552 hours, or 36 per cent of all available time. Minor delays resulting from nine general causes account for the loss of 1,801 hours out of 8,094 working hours—a loss of 22 per cent of working time and 14 per cent of available time on all jobs. Of the 12,646 available hours, but 6,293 hours are utilized in the direct production of paving mixtures.

EFFICIENCY OF MANAGEMENT VARIES GREATLY ON DIFFERENT PROJECTS

The extent to which production on the various projects suffered from major and minor delays combined may be shown by computing utilized time as a percentage of available time.

The over-all efficiency for the average job is computed as follows:

		Hours
Available time		12,646
Unavoidable delay:		
Major	3,889	
Minor	228	
		4,117
Possible utilized time		8,529
Avoidable delay:		
Major	663	
Minor	1,573	
		2,236
Actual utilized time		6,293
Actual utilized time as a percentage of possible utilized time		74

These data are shown graphically in Figure 2. The upper graph shows the distribution of available time between the two kinds of delays and productive work. The lower graph shows the distribution of working time between minor delays and productive work and a comparison of over-all efficiency at the various plants. The close agreement of utilized time as a percentage of working time with over-all efficiency indicates that the minor delays were largely avoidable and that the major delays were largely unavoidable.

These data are an index of the efficiency of management in making use of available time. However, they do not reflect the mechanical efficiency of the plants while in full production.

(To Be Continued in November)

The Editor Comments

Personal Observations and Reflections

PWA and Contractors' Bids

The effect of PWA regulations and decisions upon contractors and engineers is a constant topic of formal and informal discussion wherever one travels. Practically every convention devotes part of its program either to a serious discussion of the problem or a general whitewashing of PWA.

The situation in which the Consulting Engineer finds himself is unfortunate but there is no way out for him as long as Uncle Sam holds all the purse strings. The Engineer finds that, after twenty years of being the Czar on any job, he now has to take orders from a less fortunate engineer whose professional career folded up under the stress of the depression and who has been forced to find shelter on the PWA payroll. There are many first rate, conscientious engineers on that payroll, but as one State PWA Engineer said, he does what he thinks is fair and equitable in making a decision, but that decision must be reviewed in Washington. That particular engineer has been lucky, at least that is what he calls it, in his decisions and has been upheld, but a series of reversals might readily cost him his pay check. So the PWA Engineer, protecting the meal ticket, now looms as a real obstacle in the path of the Consulting Engineer who is accustomed to making his own decisions and being the dictator of the job. And he is still held responsible for the results!

The contractor finds himself in a most complicated situation. He is required, as always, to make his careful business bet, called a bid, and then place his very reputation in the hands of labor that someone else chooses. Do you wonder that he has been forced to raise his bids 15, 25 or even 40 per cent all because of the gamble on labor. PWA has taken away his control of choice of workmen and given it to a well-meaning group of local agents who handle the rolls of the Federal Reemployment Service, in every one of more than 3,000 counties in this country.

There are innumerable stories of the major and minor ills suffered by contractors under this set-up but the following case serves to illustrate several points. A Contractor received the award for a job in the next state, which required the use of a power shovel. He shipped in his shovel and took his shovel runner along in his car. "You can't use him here," greeted his attempt to start work with his own man on the shovel. "There are plenty of shovel men in this county. I'll have one for you tomorrow." Tomorrow grew into ten days while the FRS man searched for an operator, and all the while the shovel, a major capital investment, stood idle. Finally an alleged shovel runner was found, put in the machine and in the first swing to load a truck, he demolished the truck cab and did about $1,500 damage to the shovel. The only thing the contractor could do was to fire the operator. Then after ten days of delay and more than $1,500 in damages to equipment, he was permitted to use his own operator.

We accede to the idea that local labor should be favored for all hand work, but expensive equipment must be operated by trained, experienced men and the contractor is the best judge of the type of man he wishes to retain in his own organization. Common sense, common business decency and fair play even under the existing labor rules should have permitted that contractor to start his job at once with his own man and at least continued operation until an equally skilled local operator could be found. Instead, rules made by unreasoning bureaucratic officials had to be obeyed and another small business man was forced to lose money because of an unwise, unfair ruling. Jobs, work and action will bring recovery—tangles of red tape and indecision mean continued business despondency.

Signs with a Punch

From time to time in these pages we have published photographs and notes on signs which contractors have used to warn the touring public against the pitfalls of driving through construction projects. One of the best was "Drive Carefully—Death is so Permanent" which is used by a New Jersey contractor. One of the latest to come to our attention was used recently by a contractor in western New York. Barricades were placed across the road, as is customary, leaving just room enough at one side for the contractor's trucks to get in and out. The road was not open all the way through and the contractor did not want to have motorists trying to drive through instead of taking the properly marked detour, so he posted the sign "Impassable—Why Try?"

Theodore Reed Kendall

How the Other Fellow Did It

Ideas That Have Already Proved Helpful to Contractors

Unit Forms for Core Wall Construction

330. On a mid-west earth dam contract, the first lift of the core wall, which was 3 feet wide at the bottom and 1 foot thick at the top, was 12 feet high and consisted of 3 feet of base encasing the top of the steel sheet piling which was used as a cut-off wall, and 9 feet of wall poured between unit forms, which the contractor found most convenient. These forms were in panels measuring 2 feet wide by 3 feet high, the frame being of light angles with two angle stiffeners each 3 feet long. The face of the form was of 5-ply wood, the surface of which was treated by the manufacturer, and the forms were attached to each other by means of cut nails merely driven through jig-punched holes in the angle forms. The angle frames were slightly offset at three points in the longer angles and two points in the shorter angles to permit the insertion of strap ties and also the brackets to hold scaffolding so that workmen could place the unit forms in the next two tiers above. The ties for the forms for the cut-off wall were special carbon band iron ordered to dimension for each tier and were inserted through the offsets which were also used for placing the brackets and were held by nails dropped through short double offsets of deformations at each end of each tie. For concrete above water on other structures, rods with cones were used to permit careful finishing of the concrete surface. Liners were used on one side of the forms only and no wales were used. The vertical liners were 2 x 6's and the horizontal liners 2 x 4's. The vertical liners were held in place by an ingenious liner clamp consisting of a heavy tempered steel wire bent to a U-shape to fit over the 2 x 4's and 2 x 6's and with hooked ends fitting into holes provided for them in the angle frames of the unit forms. These liner clamps were made up with small wood blocks by the contractor, using scrap wood about 6 x 8 inches long, 3 to 4 inches wide and about 1½ inches thick. In the middle of the flat side a transverse cut was made, big enough to hold the liner clamp wire, and nails put in to hold the wire in place. For each vertical liner, two of these liner clamps were used—one sloping downward hooked into one of the top forms and the second sloping upward hooked into one of the lower forms. With a few tamps of a hammer the hooks were driven along the liner until they were held tight and then a nail driven through the block to hold them in place. The unit forms were oiled every third time they were used and the contractor found it possible to use the form from eighteen to twenty times before the face of the ply-wood lost its finish. Then the ply-wood was turned and the form used again for a like number of times. Then, if the frame had not been damaged, the ply-wood could be replaced for about fifty cents and the form continued in service. 27.5.16

Adjustable Legs for Finishers' Bridges

331. Inasmuch as finishers on concrete road jobs are not all built alike, it is just as well to have the bridges from which they work adjustable to make their arduous work as simple as possible. One bridge noted on a southern contract had adjustable legs at each end and two ⅜-inch truss rods to strengthen it. The legs consisted of 2 x 4's with iron straps around them and including a second 2 x 4. Each section of the leg and the strap had holes drilled at equal distances so that both could be run through and the legs adjusted to different lengths. Thus if one side of the road were higher than the other, the bridge could still be level for the convenience of the men, as well as taking care of long-armed and short-armed workers satisfactorily. 27.3.18

Keeping Hose Clear of the Paver

332. A horizontal section of 2½-inch pipe with a strap iron diagonal support was mounted on the paver by an Alabama contractor to carry a ring for the paver hose and the sprinkling hose so that they were always clear of the crawlers when moving, and never got mixed up in the push grader. This same contractor carried the center steel and the dowels in a box on the push grader ahead of the paver where they were out of the way and yet handy for the steel man. 27.3.18

Handling Railway Dump Cars on a Heavy Grade

333. A West Virginia contractor working in a 1,200-cut 90 feet deep at the highest point met the problem of handling railway dump cars in an interesting manner. The first operation was to cut a notch 20 feet deep through the highest point, using a power shovel and loading to a fleet of motor trucks, which hauled an average of 1,000 feet. Following this a standard-gage truck was used, laid into the cut with a rather steep grade from the eastern end over which trains of four 8-yard side-dump cars were handled. On the flat grades, a 12-ton gasoline locomotive was used, hauling the cars a maximum of 1 mile from the cut to carry the fill over the flats. In order to handle the empty and loaded trains readily on the steep grade from the end of the cut to the shovel, a novel single-track cable tramway was devised with a passing switch. At the top of the grade, a 12 x 12-inch dead man 8 feet long was buried in concrete and to it an 18-inch sheave pully was attached. A cable run through this pulley was attached to the empty cars on the switch and to a tractor. The locomotive which was at the head of the train was then uncoupled, run onto the main line and coupled to the four loaded cars and proceeded down grade to the fill. A 60-hp tractor then pulled the empties up to the shovel. On the return trip, the loaded cars practically pulled the tractor uphill, the latter acting as a brake. The maximum grade on the tracks was about 15 per cent. With this arrangement the cut was taken down to within 20 feet of grade when it became too narrow to operate the tractor and train so it was finished with trucks and crawler wagons. 27.1.15

Placing Dummy Joints Ahead of the Screed

334. On a Federal Aid project in the middle west, the contractor abided by the new state specifications which permitted screeding over the dummy joints. A poured dummy joint was used for both transverse and longitudinal joints. The steel V plate ⅝-inch wide, tapering to ¼-inch, and 2½ inches deep was inserted by a combination joint and screeding machine, immediately behind the first finisher. Before the concrete had taken its initial set, this plate was removed and the corners were edged with a special edging tool so that the joint, when poured with asphalt filler, was 1 inch wide. This made the longitudinal joint a traffic marker but a 4-inch stripe was also required by the State. At certain points, transverse contraction joints of the same character as the longitudinal joints were installed by the same machine, but in a distinctly different manner. The transverse installer which cut the groove for the steel V plate, which was placed by hand, was located in front of the machine and was operated by engine power. Following the installation of the transverse joints, the longitudinal joints were placed in position from the center of the machine, at the rear of which the screed was operated. 27.5.20

Construction Industry News

Harnischfeger Corp., Milwaukee, Wis., manufacturer of P & H cranes, shovels, hoists and welding equipment, is this year celebrating its fiftieth anniversary. The firm which started in 1884 was founded by two skilled mechanics, Henry Harnischfeger and Alonzo Pawling and was for many years known as Pawling & Harnischfeger. The story of the development and growth of this firm is told in an attractive anniversary book "The Fiftieth Year." Copies of this book, bound in gold and purple and profusely illustrated throughout its 84 pages, are being presented to friends and patrons of the Harnischfeger Corp. as a greeting on the company's golden anniversary.

Baldwin Locomotive Works, Philadelphia, Pa., has assumed all sales and engineering of the products of its subsidiary, the Whitcomb Locomotive Co., of Rochelle, Ill., and will establish an Internal Combustion Locomotive Section of its sales department, in charge of H. H. Perry as Manager, assisted by H. V. Huleguard. Mr. Perry has been Vice President and General Manager and Mr. Huleguard, Sales Manager, of the Whitcomb company. The new section will handle all sales of Baldwin and Whitcomb internal combustion locomotives of all sizes, and sales of electric locomotives except to public service railroads. The Whitcomb plant will continue the manufacture of Whitcomb products at Rochelle, Ill., in charge of Thomas H. Mars as Superintendent. Orders for repair parts, and the servicing of Whitcomb products in the field, together with attendant correspondence, will be handled at Rochelle by L. W. Wrenn as Baldwin Sales Correspondent.

Joseph Kesl Tractor & Equipment Co., St. Louis, Mo., is the recently organized successor to the Acme Equipment Co. and will represent the following manufacturers: Allis-Chalmers Mfg. Co., tractors, crawler wagons, graders, power units and wagon tracks; American Steel Scraper Co., rotary and wheeled scrapers, fresnoes, and grading plows; Baker Mfg. Co., scrapers, maintainers, bulldozers, rooters, road discs and snow plows; Wm. Bros Boiler & Equipment Co., graders and snow plows; Cushman Motor Works, portable electric light and power plants; Erie Steel Construction Co., buckets, batching plants, and bins; Foote Bros. Gear & Machine Co., graders; Gardner-Denver Co., air compressors, drills and supplies; General Wheelbarrow Co., wheelbarrows, grader blades and scrapers; Gruendler Crusher & Pulverizer Co., crushing, pulverizing, screening and conveying machinery; Keystone Driller Co., shovels, cranes, skimmers, pull scoops and drills; Lyle Signs, Inc., road, street and warning signs; Mall Tool Co., concrete vibrators; and Toledo Pressed Steel Co., torches and truck flares. The office of this new company is located at 1510 No. 13th St., St. Louis.

Bucyrus-Erie Co., South Milwaukee, Wis., has announced the appointment of the Crook Co., 2900 Santa Fe Ave., Los Angeles, Calif., as distributor for Bucyrus-Erie power shovels, draglines, cranes, clamshells and skimmer scoops in the territory of Southern California. Announcement has also been made of the appointment of the Burgman Tractor-Equipment Co., 18 Riverside Viaduct, Jacksonville, Fla., as distributor for this company's excavating equipment in the northern part of Florida. Other distributor appointments which have recently been announced are that of the Northern Commercial Co. of Seattle, Wash., for Loadmaster cranes in Alaska and the Yukon Territory, and the Mine & Smelter Equipment Co., of Phoenix, Ariz., which will act as distributor for Loadmaster cranes in the State of Arizona.

Associated Equipment Distributors will hold the annual meeting of the Association at the Edgewater Beach Hotel, Chicago, on January 11 and 12, 1935.

Independent Pneumatic Tool Co., Chicago, Ill., has announced the election of W. A. Nugent to the position of Vice President in charge of Sales, and of Neil C. Hurley, Jr., to the position of Secretary of the company. Mr. Nugent, who has been with the company for twenty years, has served in various executive capacities, the most recent being that of Sales Manager. Mr. Hurley has been in charge of the distribution of the company's electric tools.

Linde Air Products Co., New York City, distributor of materials and equipment for oxyacetylene welding and cutting, has announced the completion of plans for a four-day welding clinic to be held in New Orleans, La., starting October 24. The purpose of this clinic, which will be held in the Isaac Delgado Central Trades School, is to pass on to those interested in oxyacetylene welding and cutting information on new developments in the industry; to assist those who have welding and cutting problems; to demonstrate and give instruction on old and new applications of the oxyacetylene process; and to afford the opportunity for discussion and interchange of ideas of those attending. Anyone interested in welding is invited to attend.

Liebel Supply Co., 431 Main St., Lexington, Ky., has been appointed by the Chain Belt Co., Milwaukee, Wis., as exclusive distributor of Rex construction equipment in the Lexington territory. This company, which has been in the contractors' supply and equipment business for many years, will handle Rex building mixers, from the 3-S tilter up to the 84-S mixer, Moto-Mixers, the 27-E Roadmaker, cold patch mixers, plaster and mortar mixers, a complete line of pumps, and central mixing plants designed and built to suit individual requirements.

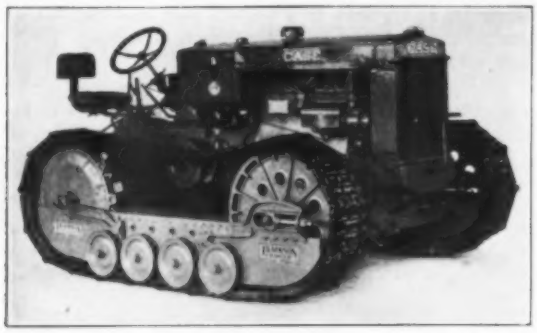
Tuthill Spring Co., Chicago, Ill., has announced the appointment of C. R. Jahn as General Sales Manager of the Guard Rail Division. Mr. Jahn will handle the sales of Tuthill guard rail for the entire United States.

Chain Belt Co., Milwaukee, Wis., manufacturer of concrete mixers and pavers, pumps and conveying equipment, has announced the appointment of R. X. Raymond as Manager of the Minneapolis District. Mr. Raymond, who has been associated with the company for over fourteen years, succeeds G. A. Gunther, who has been transferred to the Detroit territory. The Minneapolis office is located at 808 La Salle Ave., Minneapolis, and the Detroit office at 5169 Martin Ave., Detroit, Mich.

Chicago Pneumatic Tool Co., New York City, has announced the change of address of its Birmingham, Ala., office from its former location at 1829-31 South Second Avenue to 211 South 20th Street. This change, which was effected August 31, provides increased facilities for both sales and service activities. W. S. Lynch is Manager of the Birmingham District Office.

C. R. Jahn Co., Chicago, Ill., sole distributor of La Crosse Tu-Way heavy-duty machinery trailers, has announced that its offices have been moved to 760 Polk Street.

Patterson Foundry & Machine Co., East Liverpool, Ohio, has announced the election of D. M. Wilhelm who has been Sales Manager for the past four years, to the position of Secretary. Mr. Wilhelm will be succeeded by E. M. Underwood, formerly Division Sales Manager at East Liverpool.



The New Model GL Trackson-Case Crawler Tractor

Two New Heavy-Duty Crawler Tractors

DESIGNED to work with super-imposed auxiliary equipment, the two new crawler tractors recently announced by the Trackson Co., Milwaukee, Wis., have low centers of gravity, wide treads and special balance to provide stability with front, rear or side loads.

The Model G-L Trackson-Case unit is powered by a Model L Case motor, weighs 8,000 pounds and develops approximately 40 drawbar horsepower. Its track area in contact with the ground is extra large, harnessing the power so that the effective drawbar pull is high.

The Trackson Model GI-30, a feature of which is its directional transmission which provides equal agility in either direction of travel, three forward and three reverse speeds, weighs approximately 4 tons, is powered by an I-30 McCormick-Deering motor and develops 30 drawbar horsepower. Besides the directional transmission, it can be equipped with a transmission providing four forward and one reverse speeds.

The crawlers on both models have extra large load-supporting bearing area, structural strength and provisions for the inbuilding of equipment, such as booms, cranes, hoists etc. The improved heavy-duty crawler track has single-drive lugs which form a rail upon which the front and rear crawler wheels run. The front wheels are of the sheave type, while the rear wheels have drive teeth independent of the guide flanges. This design is said to assure positive action, proper alignment under all operating conditions and to provide maximum load carrying capacity.

A New Gas-Engine-Driven Welder

A NEW close-coupled gas-engine-driven Shield-Arc welder of 300-ampere, 40-volt capacity has recently been announced by the Lincoln Electric Co., Cleveland, Ohio. The generator is mounted on the engine housing with the drive lined up on hardened steel and driven on cushioned rubber. This method of coupling takes care of any misalignment and reduces vibration. A special idling device cuts the engine speed when the arc is broken, assuring economical operation of the 6-cylinder engine.

The welder is supplied mounted on a rigid steel base with totally enclosed steel side curtains. Where desired, the complete unit is mounted on small factory portable steel wheels, or large 6-inch face steel wheels for outside use or two or four-wheel pneumatic-tired trailers.

A uniform generator current permits the use of a higher average current with increased welding speed. The capacity of the new welding machine is 60 per cent higher than its predecessor and is rated at 40 volts. Other features of this new welder include dual control of the welding heat, sparkless commutation, handy height controls, and arc welded steel construction. Lincontrol, a new remote current-control device which enables the operator to adjust the current merely by tapping the electrode on the work, is supplied as optional equipment.

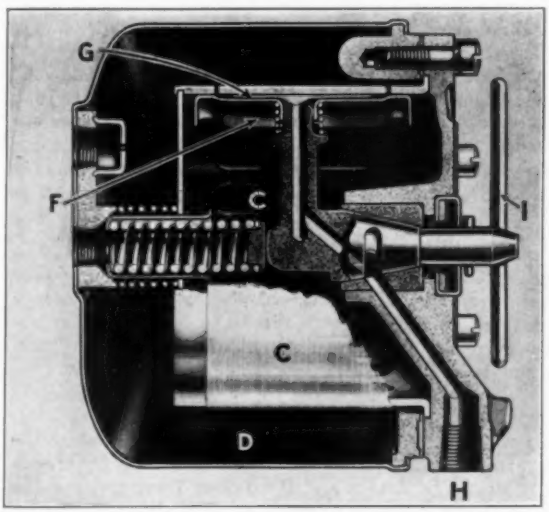
Keeping Engine Cylinders Clean

TWO new devices which are claimed to need neither replacement nor cleaning and are designed to keep the engines powering construction equipment clean and operating efficiently have recently been announced by the Handy Governor Corp., 3936 W. Fort St., Detroit, Mich.

The Handy Self-Kleen Oilfiltor is a permanently efficient installation, built to last as long as the motor it equips. Its simple self-cleaning operation can be manual or automatic. The filter assembly consists of three essential elements: a substantial metal housing; a filtering unit; and a rotating shoe containing a backwash slot and discharge vent to the atmosphere. In operation the crankcase oil to be cleaned enters the filter under the normal oil line pressure, passing into the screen where it is filtered through the screen segments, depositing all abrasive material on the inner surface of the continuous wire mesh. The filtered oil collects in a chamber and then leaves the filter. The filtration process is continuous during the operation of the engine, until it finally becomes necessary to remove the accumulated deposit from the filter element.

In the illustration, the cleaning operation is shown. The shoe F is provided with a cleaning slot G and a discharge duct H to the atmosphere. To clean, the shoe F is rotated with the handle I, bringing the cleaning slot G progressively under the grit laden segments C. As the cleaning slot passes under the segments of the screen, there is a high pressure reverse flow of the filtered oil back through the filter screen, washing away all accumulated sludge and carrying it out of the filter through the atmospheric discharge duct. Inasmuch as the backwash is done under full oil pressure, it is practically instantaneous and the segments are all thoroughly cleaned by one rapid rotation of the screen. Less than one-eighth of a pint of oil is used in the cleaning operation.

The other device is the Handy oil-washing air cleaner which removes the dirt in the initial oil bath before it reaches the metal condenser element at the cleaner mouth, keeping the condenser clean and open at all times.

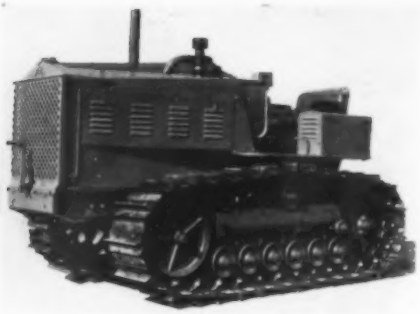


A Cross Section of the Handy Self-Kleen Oilfiltor, Showing the Cleaning Operation

Hercules Diesel Engines are simple, compact and rugged. Their success today in a wide variety of applications is due to their ability to deliver dependable and economical power . . . an ability characteristic of *all* Hercules Engines.

HERCULES MOTORS CORPORATION, CANTON, OHIO, U. S. A.

MANUFACTURERS OF HEAVY-DUTY INTERNAL COMBUSTION ENGINES AND POWER UNITS FROM 6 TO 200 HORSEPOWER



The New Cletrac 35 Diesel

Another New Diesel Tractor

THE Cletrac 35 diesel tractor, which delivers a maximum of 46 horsepower at the drawbar, with an engine of the same general construction as the one used in the Cletrac 80 diesel, has recently been announced by the Cleveland Tractor Co., Cleveland, Ohio. Embodied in this new tractor are the standard features of the Cletrac 35 gasoline tractor.

The engine of this new unit is a Hercules, of 6-cylinder design, 4⅜-inch bore by 5¼-inch stroke and operating at 1,200 rpm. It has seven main bearings and the crankshaft is balanced with integral weights. Removable liners are provided in the cylinder block. Another feature is that it is equipped with the electric starting which has been used on the 80 diesel. Standard equipment includes this electric starting, radiator guard, crankcase guard and wiring for lights.

A Portable Road-Trailer-Type Arc Welder

AN easily-portable arc welder especially designed for maintenance and repair work, is made by the Universal Power Corp., 1719 Clarkstone Road, Cleveland, Ohio.

A feature of this new 300-amp unit is the Staidarc principle for arc stabilization similar to that used in its motor generator sets. The combination of the Staidarc with the new Ford V-8 engine is designed to give a stable and flexible performance. Other features of the Universal trailer-type arc welder are the novel mounting of the horizontal radiator directly over the engine, with a blower-type fan, and a sliding cover over the radiator which allows for the proper amount of radiation and cooling, regardless of temperature conditions.

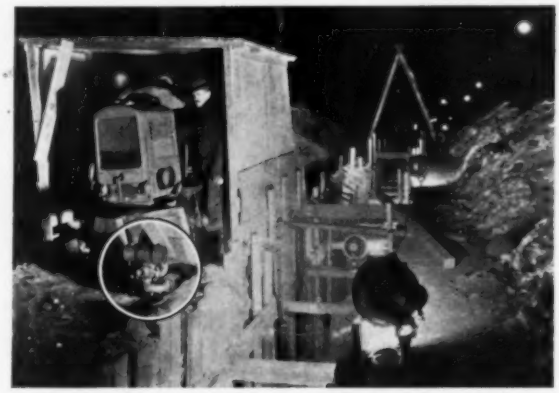
The Universal high-road-speed trailer arc welding unit is mounted on two wheels with "donut" tires, making it suitable for field use.

The Universal Trailer-Welder

A New Lighting System for Night and Day Use

A NEW easily-portable 1,250-watt generator with floodlights, which is designed to speed emergency repairs and to enable construction after dark, has recently been announced by the Homelite Corp., 71 Riverdale Ave., Port Chester, N. Y. This Homelite generator, which weighs only 80 pounds complete with its built-in gasoline engine and can easily be carried by one man, is fully automatic and requires no adjustment. Its light weight and compactness makes it possible to stow it away in a corner of a truck or automobile, ready for emergency repair work or the continuation of work after dark.

In the daytime, the generator can be used for operating electric saws, drills, hammers, sanders, paint spray guns and other electrically-operated equipment. Recently a New Jersey contractor used one of these generators to operate an electric sander for smoothing the inside of his forms for a retaining wall before pouring, thus saving time and expense in his finishing operations.



A Homelite Generator (in the circle) and Floodlights Making Possible Night Work

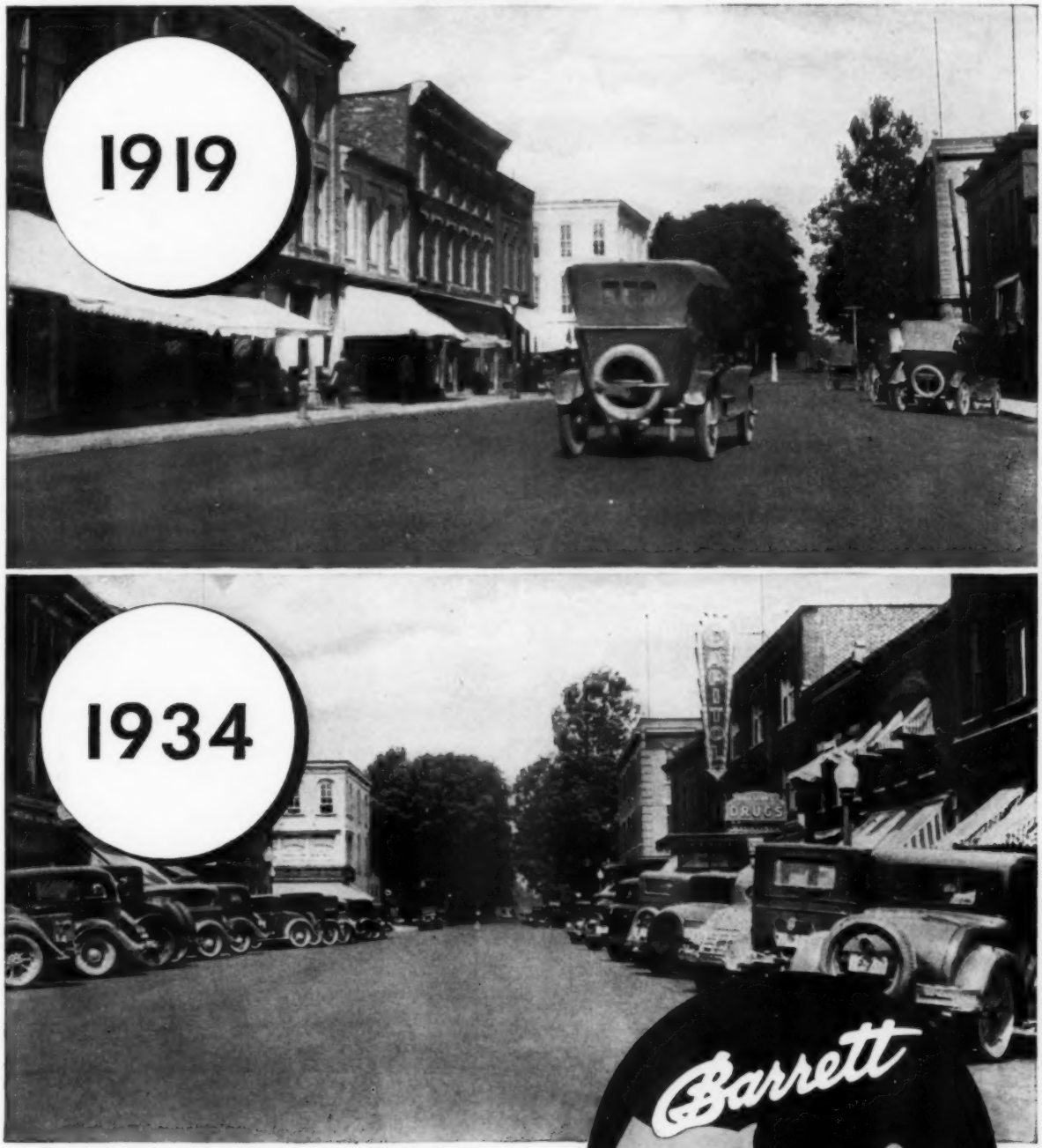
An Addition to Line of Diesel Engines

MODEL DRXB, a 4⅜ x 5¼-inch diesel engine, with a displacement of 474 cubic inches and a rating of 45.9 horsepower, developing 120 horsepower at 2,000 rpm and a maximum torque of 340 foot-pounds, has recently been added to its line of six-cylinder diesel engines by the Hercules Motors Corp., Canton, Ohio. This engine interchanges with the Hercules gasoline engines known as the YX and RX series in installation measurements.

The engine is a full diesel of the auxiliary combustion chamber type which controls the burning of the fuel. Both the crankshaft and camshaft are carried on seven bearings, the former being 3 inches in diameter with 2⅝-inch crankpins and full floating piston pin 1⅝ inches in diameter. The main and connecting rod bearings are removable steel shells lined with high-lead bronze, capable of carrying high temperatures and pressures. Other features are aluminum alloy pistons; heat-treated chrome nickel molybdenum steel connecting rods, rifle drilled for wrist pin lubrication; connecting rod bolts forged integral with the connecting rod forgings; wet-type removable sleeves for cylinder liners; water jackets with a centrifugal-type water pump; forced-feed lubrication to all main and connecting rod bearings, wrist pins, timing gears and the overhead valve mechanism, and the splash or throw-off from the rod bearings lubricate the cylinder walls.

This model is also built into complete power units, either fully enclosed or as open types.

Norfolk Street, Simcoe, Ontario, Canada. Tarvia-built in 1919. The upper photo was taken in 1921; the lower shows the condition of Norfolk Street today. The contrast in traffic conditions shows the change in urban life during the past fifteen years . . . a change made possible by good roads.



● **Tarvia roads can be built and maintained in weather that often compels suspension of work on many other types of roads. For last minute jobs, for necessary repairs and maintenance or for road-building to provide emergency work far into the winter, Tarvia provides a logical and economical answer. The cooperation of Tarvia field men places the unmatched facilities and thirty years' road-building experience of The Barrett Company at your service. 'Phone, wire or write our nearest office.**

Barrett
Tarvia
GOOD ROADS AT LOW COST

THE BARRETT COMPANY
Toledo Milwaukee Detroit Baltimore Bethlehem Rochester Portland, Me.
New York Chicago Philadelphia Cleveland Birmingham St. Louis Lebanon Minneapolis Columbus Youngstown Boston Buffalo Providence Syracuse Hartford Cincinnati
In Canada: THE BARRETT COMPANY, LTD. Montreal Toronto Winnipeg Vancouver

A New Closed-Back Hand Shovel

A NEW hand shovel, known as Wood's Closed Back, which resembles the familiar hollow-back type shovel except that instead of the usual hollow in the back of the blade there is steel plate welded securely to the blade and extending up the socket, has been announced by the Wood Shovel & Tool Co., Piqua, Ohio.

The upper part of the plate is free to permit flexing and, since it is so designed that there is no strain on the insert, it can not pull loose. By this construction, the one-piece steel blade is made smooth both front and back, and yet permits the use of the tapered steel socket which is heat-treated to provide strength and springiness.

Other features of this new shovel are the straight handle and turned shoulder. To replace a handle it is necessary only to push the new handle into position and replace two rivets. The turned shoulder consists of a lapping over of the metal at the top of the blade and the pressing of this double thickness of metal into a sturdy beading which is designed to give greater strength to the frog, eliminate blade splitting and provide foot comfort for workers.

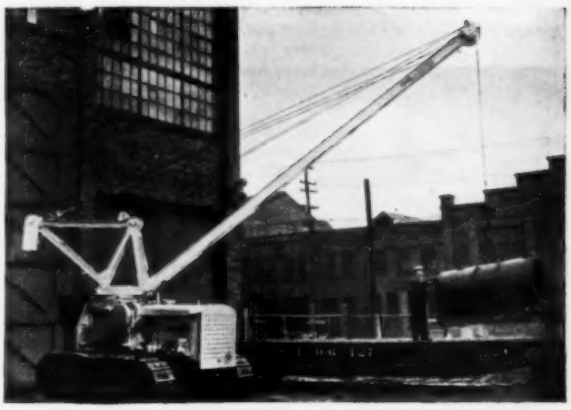
A Wood Hand Shovel, Showing the New Closed-Back Feature

A New Drill for Heavy Sinking

A NEW 3-inch drill for heavy sinking, particularly in hard ground, long hole quarry drilling and in broken formations, has recently been announced by the Chicago Pneumatic Tool Co., 6 East 44th St., New York City. The CP-52 is symmetrical and well-balanced in design and, being fully-cushioned and valve-actuated, maintains its drilling speed under varying air pressure and does not fog or freeze with wet air.

The valve is rugged, fast and positive in action, giving powerful rotation. It is housed in a renewable case within the cylinder, with bushings at points of wear and automatic lubrication. Continuous and emergency blowing keeps the hole clear of cuttings. For hard ground and short holes, where continuous blowing is necessary, the CP-52 can be equipped with an air rod in place of the air tube. A sturdy forged spring-cushioned retainer holds and pulls the steel.

The CP-52 is 24¾ inches long, overall with retainer, has a ¾-inch air hose and weighs 80 pounds. The CP-52W, the wet sinker, which is identical with the CP-52 except for minor details, is available where wet drills are required. It carries a ½-inch water hose and both drills have a standard sized shank of 1 inch hex. x 4¼ inches.



The New Model of the Loadmaster Crane

Increased Capacity and Mobility Features of New Crane

A MOBILE crane of heavy and rugged construction, with nearly three times the capacity of previous models of the same style, has recently been announced by the Bucyrus-Erie Co., South Milwaukee, Wis.

This crane, designated as CT-50 Loadmaster, is powered with a Caterpillar Fifty gasoline or diesel engine and is mounted on modified crawler tracks. It is provided with a 30-foot boom and swings through an arc of 240 degrees. The lifting capacity is 13,900 pounds at a 12-foot radius. The hydraulic stabilizers are mounted between the equalizer beam and heavy brackets cast integral with the machine frame, and provide maximum stability for the crane when operating over the side, even when the machine is standing on sloping or unever ground. When the Loadmaster is traveling, the equalizers are not set and the crawler belts have their full oscillation. The crawler treads are 20 inches wide and the long frames provide increased stability of the machine when handling heavy loads.

Photograph: courtesy of Haynes Stellite Co.

AN AID IN RECORD-BREAKING CONCRETING AT HOOVER DAM

This ring, part of a cement pump air valve, is protected against the wearing action of finely divided cement particles by a welded deposit of cobalt-chromium-tungsten hard-facing alloy which the operator is applying on the inside diameter

with
ls of
the

vered
nted
oom
acity
lizers
ckets
mum
when
When
d the
reads
eased